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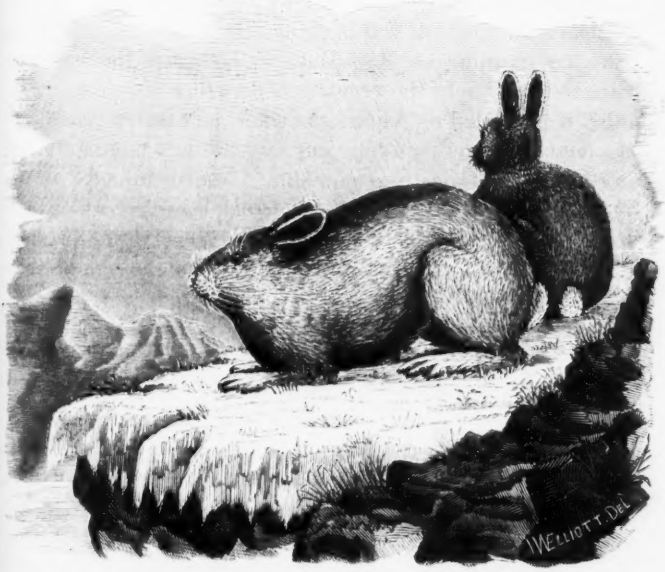
A NEW SPECIES OF HARE FROM THE SUMMIT OF WIND RIVER MOUNTAINS.

BY PROF. F. V. HAYDEN.



In the summer of 1860, the U. S. Exploring Expedition under the command of Capt. William F. Raynolds, U.S.A.,

crossed over the Wind River Mountains into the valley of the Columbia River. The writer was connected with that expedition as Geologist and Naturalist. May 30th, we camped at the foot of the eastern slope of the mountains, at the source of Wind River. It was a beautiful locality, and at this time the spring had fully come. Myriads of flowers covered the valley, and the trees and shrubs were clothed with foliage of the peculiar bright green color characteristic of this mountain scenery. On the north side of this valley were the rugged basaltic ridges of the western end of the Big Horn Range, where it united itself with the Wind River Range, and on our left were the forest-covered, gently descending slopes of the Wind River Range. Fine springs issued from the sides of the mountains everywhere, and all the little branches were full of trout.

On the morning of May 31st, we ascended the eastern slope, and gradually the vegetation dwindled down in size, so that it presented an Alpine character, and before reaching the summit, we were pushing our way through ten or fifteen feet of snow. Upon the summits of these mountains quite large areas are covered with perpetual snow, portions of which melt away in midsummer. Every few moments the clouds dropped down rain or snow, and then the sun shone out as bright as ever. We were obliged to spend several days on the summit of these mountains. So far as I could ascertain the fauna on the west side of the Wind River Mountains is quite distinct from that on the eastern side. One day I noticed a group of singular tracks on the snow which seemed different from any I had ever observed in the West, and they appeared to belong to an enormous species of hare. Descending the western slope about a third of the way from the summit, we saw a number of these animals in the little patches of pine forests, and succeeded in capturing several of them, old and young. I saw at once that it was a species not previously observed by me, and most probably undescribed. The following is a brief description of this hare:

Lepus Bairdii Hayden, Baird's hare.—Summer dress: General color gray, glossed behind, especially on the rump, with sooty black; feet and tail, and the edges of the ears white, the latter not darker at tip. Nape sooty. In winter pure white. Length to base of tail about sixteen inches (tail mutilated). Ear three inches high; hind feet six inches long.

This interesting new species of Alpine hare, as far as our observations extend, is confined to the Wind River Mountains, where it is by no means rare, and forms a characteristic feature of the landscape, its unusually broad feet expanding with each step, forming a set of veritable snow-shoes, enabling it to pass rapidly over the surface of the snow without sinking. It is readily distinguished from Townsend's Hare, or the Missouri Jackass Rabbit by its smaller size, much shorter ears, and different colors. It is considerably larger than *L. sylvaticus* and *artemisia*, with disproportionately large feet and sooty nape, being neither chestnut nor reddish. In some respects it resembles *Lepus campestris* of the Hudson Bay country, which, however, is more like *L. sylvaticus*, although much grayer, and like *L. Bairdii*, with a sooty nape. It is, perhaps, with the true Polar Hare (*Lepus glacialis*) that it is to be compared the most properly. Its summer dress is much the same, but it is much smaller, and lacks the black tips of the ears. The hind feet are, however, of nearly the same size.

This hare seems to be restricted to a comparatively small area on the summits of these mountains, near Fremont's Peak, about longitude 110°, and latitude 43°, so far as our present knowledge extends; and its natural habitat appears to be among the perpetual snows, from which it descends at pleasure to the little open spots on the slope for its food. If it were widely distributed it could not so long have eluded the observations of so many travellers who have crossed these mountains before and since 1860. But at this immediate locality it appeared to be abundant. It subsists on grass, but is very fond of the bark, buds and leaves of small

shrubs, especially the pine buds. Its meat is very white and tender, affording the most delicate food for the traveller. For tenderness and fineness of fibre, the meat of this hare not only differs from, but surpasses all others of the West. It holds a similar position among the hares that the Dusky Grouse does among the Western Grouse; both have white and very delicate meat, and prefer to obtain their food from the pine shrubs.

Descending the western slope of the mountains into the valley of the Snake Fork, we were again surrounded with all the indications of spring. The trees were clothed with fresh green foliage, and myriads of flowers were in bloom, and all signs of winter had passed away. In the course of a single day one may ascend to the region of perpetual snow, and descend again to that of spring and summer.

THE SAND MARTIN.

BY AUGUSTUS FOWLER.

THE Sand Martins (*Hirundo riparia*) visit their accustomed breeding-places in Essex County, Massachusetts, usually the first week in May, in companies sometimes to the number of fifty pairs. They select the bank of some river, or the sides of any large excavation, in which they dig a hole from one to three feet below the surface of the ground in a straight, horizontal direction. The holes are usually from two to three feet in length, and often within a few inches of each other; the entrance and passage-way to the nest being of an elliptic form. They prefer the most perpendicular banks, with a stratum of sandy loam below the soil. They live together in the most social manner, and unlike the White-bellied Swallow (*Hirundo bicolor*) are seldom seen to quarrel with each other. If at any time one of them should, in digging his hole, intrude upon the passage

of another already excavated, he leaves it and begins a new one in some other place. After having completed their burrow they deposit at its farther extremity a small quantity of soft dried grass, so adjusted that the largest part of the material is placed towards the passage-way, and then line it with a few large *white* downy feathers. I say white feathers, because I have always observed they prefer the whitest they can get for the purpose; it shows a proper taste in the birds, a fit symbol of their innocence, and I should be surprised to find a swallow's nest of this species lined with black or even dark-colored feathers. In the nest thus formed the female deposits from four to six eggs, which are pure white, with a very thin transparent shell; they are six-eighths of an inch in length, and one-half of an inch in breadth. Nature has not bestowed on this bird that graceful motion when on the wing that the Barn Swallow exhibits, but she has given it the most amiable disposition of all our swallows.

I have noticed an instance of the sense and reflection of these birds, for if reason did not influence them in their operations, it seems as if there never was evidence of its existence in animals. There is in the town of Beverly a bank, formed by the removal of clay for the purpose of making bricks, which is every season occupied by twenty or thirty pairs of these birds. Above the clay there is a stratum of sandy loam, from two to three feet in depth; in this they burrow from two to three feet. There is likewise in the town of Danvers a bank which swallows occupy, in which the layer of loam is mixed with gravel or small stones. They excavate this bank to the length of five, seven and even nine feet. For two or three seasons it was undermined.

Why should there be such a difference in the length of the burrows made by the same species of birds, in situations not more than a mile distant from each other? In one bank, after examining a number of their holes where the earth was of a fine sandy loam, easily perforated, it was noticed that

from the entrance to the extremity, the burrows did not exceed three feet in length, while in the other bank, with harder loam to work in, one burrow was found which was nine feet in length; and after examining six different holes, of nearly the same length, it appeared that these little birds had sufficient reason for extending their labors so far in the earth; in every instance where they met with a spot of loam, free from stones, they finished their burrows; if they met a stony soil they showed great care for the welfare of their eggs or young in avoiding a catastrophe so great as would befall their treasures if by accident a stone should fall upon them; for this reason they excavate to the great depth above referred to. As with man so it seems with them; reason appears to teach them what effects certain causes will produce; hence the care they exhibit in depositing their eggs in a place free from danger of harm.

After they arrive at their breeding-places, they seem to spend a few days in consultation with regard to the organization of their little colony; at such times numbers of them will be seen clinging to the bank, keeping up a low twittering, while others may be seen circling and wheeling around with much apparent joy, passing each other with that gracefulness and ease that are characteristic of no other birds except those belonging to the swallow family, not however without a friendly greeting in a low chatter, with a little variance of cadence. No party of beavers are more regular, or swarm of bees more formal, than are the colonies of these birds.

In watching their operations, while some were perforating the bank and others leaving it, in search for or returning with materials to construct their nests, it is noticeable that at a given signal, a short time before sunset, they quit their labors simultaneously, and in a few moments not an individual is seen near the bank, but over some pond, or field, or high in the air hunting their food. And when the colony returned it was in the same manner, all in company; they

would then hover awhile about the bank, and one after another dive into their burrows and disappear for the night.

Another interesting period in the life of this bird is when their young begin to fly. No mother looks upon the first steps of her child with more interest and pleasure than do these birds seemingly upon the first flight of their offspring. For a few days the young appear at the entrance of their burrow, watching the old birds in their flight as they pass and repass, and stopping now and then to leave them food, and are at last induced to leave the bank and try their wings. when they are followed by their parents until they are safely perched upon some object, to receive in a chattering way, their praise and congratulation for the success in their first attempt in flying. The young are fed for a few days upon the wing, and when abandoned to seek their own food may be seen in pairs or small parties, two or three miles from the place of their nativity, skimming over the fields and pastures. Their food consists entirely of insects.

Among the festal days observed by the Greeks, there was one called "the Welcome of the Swallows," when the children would march through the streets with garlands of roses and with music to receive presents, and as this swallow is one of those interesting "guests of summer" which always visits us, and as there is not even a suspicion that he is harmful to man, let us welcome him.

THE WHITE-FOOTED OR DEER MOUSE.

BY J. D. CATON.

This species of the *Mus* family has been noted for two characteristics, not confined to it alone but still rare. One is that it is an active tree-climber, and very frequently makes its nest upon or in trees, sometimes at a considerable distance from the ground; and the other is its mode of transporting

its young, which, as usually observed, is by the latter adhering to the teat of the mother, who drags them along in her flight from danger.

In October last I observed a bunch of sticks and twigs in a thorn bush, about thirty inches from the ground, about the size of one's head and rounded on top, with no appearance of ever having been occupied by a bird. When the axe-man struck the root of the tree, a White-footed Mouse (*Mus leucopus*) rushed from the nest with two of her young family, fully half-grown, attached to her. She coursed up and down the limbs, and from one limb to another, dragging her heavy load after her. Occasionally both would drop down on either side of the limb along which she was dragging them. Sometimes when she would reach a lateral branch, the young hanging its whole length below it, she would *yank* the infant with a force truly surprising, which must have been a severe test upon the hold of the little one.

Two observations interested me particularly: First, the young were not adhering to the teat, which has been supposed to be the universal habit of this mouse, but were adhering *to the outside of the thighs*. In this observation I do not think I could have been mistaken, as I was struck with this peculiarity, and stood within a yard of them, and she stopped in plain view several times in apparent doubt as to which way to go, and once on a limb about an inch in diameter, and with one of the young hanging down on either side, which gave me the best possible chance for an accurate observation. The young, though large enough to have fled much faster than the mother could drag them, made no effort to assist in the flight, but contented themselves with passively hanging on. Second, the young were of a dull blue or lead color, *darker* than the common house-mouse, and *showing no white* on the feet, belly or sides, which is always observable in the adult.

My desire to secure them as specimens was overcome by my sympathy for the afflicted mother, and I allowed them to

escape. This was done after having once retreated to the nest, and left it again upon a new alarm, when she run out upon a limb as far as she could, and jumped to the ground, a distance of full four feet, the young still adhering to her.

I did not, as I should have done, examine the internal arrangement of the nest. If she had taken possession of an abandoned bird's nest, she had completed the structure by adding to it till the top presented a full convex form.

THE FLORA OF PALESTINE AND SYRIA.

BY REV. GEORGE E. POST.

PALESTINE and Syria embrace four distinct botanical regions:

I. The sea-coast plain and lower slopes of the hills, with the deeper valleys, which run far into the heart of Lebanon and the hill country of Galilee. The climate of this region is subtropical, and fosters the development of the banana, the palm, the sugar-cane and the orange. In this region frost is almost unknown, snow is quite rare, being seen only once in ten or fifteen years, and the hot sun of summer pouring on a soil made humid by irrigations, develops a luxuriant vegetable life.

II. The mountain sides, from 1000 to 4000 feet above the sea, with the valley of Cœle Syria, and the plain of the Orontes. Here the flora changes. The palm will no longer flourish. The banana refuses to fruit. The orange and the lemon cease to be productive, and their place is taken by the oak and the willow, and the pine and the maple. The olive and the mulberry are equally productive in this and the foregoing region, but in this form almost the only orchards, while on the plain they share the attention of the farmer with the before mentioned trees. In this region wheat and

barley flourish, and the vine attains the most perfect development. The herbaceous flora of these two regions is similar in type, except that as we rise on the mountain sides the Tetragontheca and Stachys, and Squill and Pancratium of the plains begin to yield to the thorny mountain species of Astragalus, and Tragacanth, and Eupigium, and the aromatic Origanums and Teucriums.

III. A third region comprises a small part of Cœle Syria, near the head waters of the Litany and Orontes, with the plain east of Damascus and Hums. The soil of this region is thin, being fit only for the production of grasses and thorny herbs, the scanty pasture of the Arab's flocks and herds. Here grow *Centaurea dumulosa*, and *Delphinium anthoroides*, and many Astragali and other Leguminosæ, while not a solitary tree, or even shrub, enlivens the dreary landscape. It is the type of those great waterless plains, which, for a short space, interrupted by the fertile district of Mesopotamia, extend eastward through Persia to the great desert of Cobi.

IV. The fourth of these regions is from the height of 4000 feet on Lebanon and Hermon, to their snow clad summits. Here the scanty remains of their once extensive forests of cedar and oak, and pine, end at an elevation of 6000 feet above the sea, and for the remaining 4000 feet of naked rock, we have left such treelets as the Cotoneaster, and *Prunus prostratas*, and *Daphne olœoides*, while the herbaceous flora is represented in the lower regions by *Astragalus lanatus*, *Alyssum montanum*, and *Ranunculus demissus* and *Viola ebracteolata*, and higher up by hemispherical bogs of a species of *Astragalus*, *Onobrychys tragacanthus* and *Acantholimon Libanoticum*, while on the extreme summit of Lebanon we find *Ucia canescens*, and of Hermon, *Pyrethrum densum*.

A fifth region might be enumerated, viz., the plain about Jericho, in which, owing to the depth of its surface below the sea, about 1300 feet, and the reflected glare of the sun from the mountains and surface of the Dead Sea, the heat

mounts to equatorial degrees, and a flora is found resembling that of Lower India. More than twenty species are found here and around Engedi, which are not found again until we cross the Himalayas.

Thus it will be seen, that while on the summit of Lebanon there is a plant, *Oxygia reniformis*, belonging to the Arctic flora, in the valley of the Dead Sea we have representatives of the vegetation of the torrid zone, and this in the midst of a region with a temperate climate, by a special arrangement, seemingly designed to extend the range of human thought and observation within limits almost microcosmical. For while on any high mountain in the tropics we may have the near conjunction of these diverse forms of vegetable life thus answering the ends of variety and comparison, yet the general surface of the country in such cases would be torrid, and hence ill-adapted to the development of a hardy independent race, such as inhabited the mountains of Palestine and Syria. In the Holy Land, however, the end is gained by sinking a small section down to a tropical level, leaving the rest of the country more favorably situated for the support of vigorous life, and the development of individuality of national character.

A single observation more is in place here. It is that in Syria all plants necessary to life, or conducive to health, are either indigenous or flourish under cultivation in the open air, and that the indigenous materia medica supplies types of all the leading groups of remedies used in the healing art. This statement is illustrated by the fact that in the gardens of Syria grow the potato, bean in all its varieties, Indian corn, egg-plant, squash, pumpkin, artichoke, cucumber, onion, tomato, turnip, cabbage, cauliflower, spinach, carrot, beet, and many other vegetables, and the lemon, orange, citron, pomegranate, apricot, plum (in all varieties), peach, apple, cherry, blackberry, mulberry, banana, fig, date, grape, and other kinds of fruit; the walnut, pistachio, filbert, almond and other nuts; the squill, castor oil plant, elaterium, scam-

mony, colocynth, salep, acacia, galls, poppy, *Conium maculatum*, aloe, various Euphorbias, madder and many other medicinal and economical plants.

THE FAUNA OF MONTANA TERRITORY.

BY J. G. COOPER, M. D.

(Concluded from page 84.)

III. REPTILES.

HORNED TOAD (*Tapaya Douglassii* Gir.). A single specimen was obtained at Fort Benton. Though found on the Columbia Plains this species does not seem to cross the mountains at this point, but probably does so by the head of Snake River.

RATTLESNAKE (*Crotalus confluentus* Say, possibly also *C. Lucifer* B. and G.). I saw but two rattlesnakes in the Rocky Mountains, which were on a prairie along Hell Gate River. Expecting to find more I did not preserve them, but as specimens were probably obtained by Lieut. Mullan, I mention the localities of this and other reptiles which I did not preserve. All kinds were very scarce in the mountains, and this, which is so abundant along the Platte, is rather rare near Fort Benton. I mention this as the species seen on the west slope, because the Bitterroot Mountains are a far greater obstacle to the migration of the *C. Lucifer* eastward, than the main divide is to that of this, and I killed some of *C. confluentus*, probably, as high as 5000 feet above the sea on the east slope.

PINE SNAKE (*Pituophis*). I also got a Pine Snake at Fort Benton.

GREEN RACER (*Boscanion vetustus* B. and G., or *B. flaviventris?*). I saw one dead specimen of this snake along Hell Gate River in August.

WANDERING GARTERSNAKE (*Eutainia vagrans* B. and G.). Rather common along Hell Gate and Bitterroot River.

Toad (*Bufo Columbiensis* B. and G.?). A large toad was occasionally observed along the Hell Gate and Bitterroot Valleys, but was not very common.

Spotted Frog (*Rana halecina* Kalm). I saw this frog on the Missouri among the mountains, which it probably crosses, being found at Fort Dalles by Dr. Suckley.

IV. FISHES.

Lewis' Trout (*Salmo Lewisii* Girard). This fine trout abounds in the headwaters of the Missouri, up to their sources on the eastern slope of the mountains, and a few were taken at and near Fort Benton by the soldiers, all of them large ones. They bite readily at almost any artificial fly; also at insects, meat, pork, and even leaves and flowers, after they had been tempted with grasshoppers. Officers and men, nearly all who were not on duty, would crowd to the banks of the beautiful mountain streams, and catch as many as the whole command of three hundred men could eat every day, and with tackle of all kinds, from a rude stick with a piece of common twine and a large hook, to the most refined outfit of the genuine trout-fisher. The form differs very much from the figure given in Dr. Girard's Report, and in the Natural History of Washington Territory, being, as the specimens show, much more elongated, like most other species. I also took specimens of small size across, to compare with those on the western slope, and am very doubtful whether these can be considered a distinct species, though a comparison of larger specimens may prove them to be so. If distinct, the trout of the western slope is exceedingly near *S. Lewisii*. It is equally abundant down to the crossing of the Bitterroot, but less so in the streams on both sides of the Cœur d'Alene Range, probably from their excessively shallow and rapid current. I saw no difference, however, in those taken at Cœur d'Alene Mission from those of the Little Blackfoot. The differences noticed between these and those of the Missouri were as follows:—Evidently fatter and in better

condition, from which, I suppose, arose the deeper tint and greater extent of the rosy tint on their side and belly; back paler olive; spots fewer and chiefly near the tail, where they assumed a more stellate arrangement, but this was not constant. Very young specimens, four to five inches long, were barred on the sides. I saw none so small on the east slope.

No. 61, Little Blackfoot River, August 17th. No. 69, near crossing of Bitterroot River, September 2nd. Length, 14.75 inch; olive, below silvery with rosy tints towards sides; spots black; operculum, etc., bronze gilt; chin-mark orange.

Salmo sp.—A single specimen of a species of trout was caught by Lieut. A. V. Kautz, U. S. A., on September 25th, just below the ferry across the Spokan River, at Antoine Plant's. Its very dark hue corresponds to the color of the stream, which is often the case in fish of the same species found in different localities, but it otherwise differs very much from the preceding. There is a high fall of the river *below* this point not passed by the salmon, so that this species cannot be a hybrid with them or anadromous either. No. 121, dried skin; colors when fresh were very dark olive above; belly dull white (no rosy marks); chin-mark reddish purple; operculum coppery, with a deep purple tint, this continuing as a broad streak along lateral line. Form of head very obtuse.*

SUCKLEY'S SALMONTROUT (*S. Suckleyi* Cooper, nov. sp.).

*Besides *Salmo Lewisii*, the following fish were caught at and near Fort Benton, most of which, probably, do not go above the falls:

PIKE PERCH (*Stizostedion boreus* Gir.). Not very common.

CATFISH. *Pimelodus olivaceus* Gir. was the only catfish seen above Fort Union, below which *P. ailurus* Gir. is common. It is excellent eating, preferred by many to trout, which cannot be said of other catfish.

MILK RIVER SUCKER (*Acomus lactarius* Gir.). Common and very poor eating.

MISSOURI SUCKER. (*Catostomus Suckleyi* Gir.). Not very common.

NEBRASKA DACE. (*Pogonicthys communis* Gir.). Abundant below Fort Benton, but scarce so far up.

MISSOURI HERRING (*Hyodon tergisus* Lesu.). Common, and bites sharply like a trout, giving good sport, but is poor food.

SHOVEL-NOSED STURGEON (*Scaphirhynchus platirhynchus* Baird). Several were caught near Fort Benton.

PIKE (*Esox sp.*). This large pike was cut up before I saw it, and I only got the head, which I gave to Mr. Hildreth to send to Washington.

I obtained also in the Rocky Mountains a species of Whitefish (*Coregonus?*), a Cottoid (?), and four species of *Cyprinoids*, which are probably still undescribed, but the specimens were too much damaged in alcohol to determine them with certainty.

Salmontrout of the Kalispelm or Lake Pend d'Oreille; Suckley, Report on Natural History of Washington Territory, under *S. Gibbsii* (?).* The first of this splendid salmontrout we met with were at the mouth of St. Regis Borgia creek, which flows down the east slope of the Cœur d'Aleñe Range, and joins the Bitterroot, where the road crosses and leaves that river. The large specimen was brought to camp by Indians. An old mountaineer who keeps the ferry, said that they could be caught with a hook baited with a small fish, but these two had evidently been speared. We saw several of them in this stream, but all refused to bite at a fly or any common bait. Those caught in the Cœur d'Aleñe, on the west slope, seemed to be identical, and I preserved a small one (No. 110, in alcohol). No. 95 was evidently about spawning, the ova being as large as peas, like those of the large salmon. Its colors were pale olive above, with irregular greenish patches; sides yellowish, beneath silvery white; fins and tail tinged with red; spots on back carmine, large and few; tail a little emarginate; length 29½ inches. The other was slightly smaller, otherwise like this. No. 110, young, was darker above, and colors brighter.

Dog Salmon (*Salmo canis* Suckley). Below the forks of the Spokan, the Indians were catching myriads of this salmon, and curing even those washed ashore, in their exhausted, diseased condition, without scales, and presenting all the appearances described in our report of 1853, relating to the salmon of the Upper Columbia.

*This query in Dr. Cooper's manuscript we suppose means that he did not have the book at hand, and was not sure that the specimen he refers to was mentioned by Dr. Suckley under *S. Gibbsii*. As we cannot find a reference to the locality given under S. Gibbsii, we think that Dr. Cooper intended to refer to the following paragraph by Dr. Suckley under *Salmo spectabilis* Gir. (Nat. Hist. of Washington Territory and Oregon, page 343). "In Lake Pend d'Oreille, a sheet of water formed in the second chain of the Rocky Mountains by a dilatation of the Clark River, of much the same size, shape, and general character as Lake Geneva in Switzerland, I have seen a very handsome species of red-spotted lake trout. The spots along the flanks are of the size of large peas, and are of a beautiful rose color. The length of the adult fish will average twenty inches. Its form is slender, and the dorsal profile but slightly arched." Much valuable and interesting information relating to the Salmonidæ of the northwestern part of America is contained in Dr. Suckley's chapter on this family in the Natural History of Washington Territory, etc.—Editors.

THE FLOWERS OF EARLY SPRING.

BY REV. J. W. CHICKERING, JR.

THERE is perhaps a nearly equal charm about the notes of the first robin, and the sight of the first Mayflower. It will be the object of this article to enumerate, with a few notes upon each, some of our earlier floral visitors, in wood and meadow, in New England.

The list opens, not very attractively, with a plant well known to all, under the mal-odorous name of Skunk Cabbage (*Symplocarpus fœtidus*), but whose flower is by no means so familiar, save to the observing botanist, and even he must be on the alert to obtain this first gift of Flora, in full perfection of color and aroma. Early in April, or even in March, almost before the ice is fairly melted, may be found in low marshy ground, this flower, clumsy in form, repulsive and snaky in color, dark purple with yellowish blotches, and disgusting in odor; soon to be followed by the clump of large fleshy leaves, conspicuous during the rest of the summer. Like Stramonium, and most other noxious and unsightly weeds, it has been tried as a remedy for asthma, and with about as much effect.

In very pleasing contrast comes next *Epigæa repens*, or as it is sometimes miscalled Trailing Arbutus, better and more appropriately known throughout New England as the Mayflower.

This, among the very earliest, is also the choicest gift that Flora has in this latitude to offer us, alike for its beauty of form and color, its delicious fragrance, and its charming habit of peeping out, almost from the edge of the retreating snowdrifts. To find the first bunch of Mayflowers is the ambition of many a boy and girl, as well as not a few children of larger growth. The finest specimens ever seen by the writer were from a mountain in Camden, Maine. It has

also been used as a medicinal agent, but with no better nor worse results than many others. It is a true wild flower, resisting all attempts at domestication. Closely associated with this is found the *Hepatica*, in its two forms of *triloba* and *acutiloba*, one with rounded, the other with pointed leaves, probably merely varieties. The little clump of flowers pushes its way through the ground, often in advance of the leaves, and with the varying shades of pink, blue and white, seen in different plants, is a welcome addition to our spring bouquet, though lacking the fragrance of the Mayflower.

About this same time the southern aspect of rocky hillsides begins to whiten, with the cheerful, though not specially graceful or showy flowers of the Early Saxifrage (*Saxifraga Virginiensis*), and in forest marshes the inconspicuous little Golden Saxifrage, with a name longer than itself (*Chrysosplenium Americanum*). Soon in the meadows the carpet of living green is embroidered with the golden flowers of *Caltha palustris* or the English Marsh Marigold, improperly called Cowslip, and whether correctly or not, associated with creamy milk and yellow butter, while a little later are seen in the morning sun, the white stars of the Bloodroot (*Sanguinaria Canadensis*), as fragile as they are beautiful, generally lasting but for a day. Its orange-colored juice is much used in medicine as an emetic, an expectorant, and a liniment. This plant readily bears transplanting, increases in size under cultivation, and becomes one of the most attractive ornaments of the early flower border. In some parts of the country is found a somewhat similar flower, the Twin-leaf, or Rheumatism Root (*Jeffersonia diphylla*), also well repaying cultivation.

Meanwhile the pastures are beginning to whiten (last year remarkably) with the modest little Houstonia, or Innocence (*Oldenlandia cærulea*), while a host of violets are making their appearance. *Viola blanda*, a wee, white, sweet-scented species, in the woods; *cucullata*, with its large blue flowers

and hood-shaped leaves, with their curious palmate variety; *rotundifolia*, with yellow flowers and shiny leaves; and on the hillsides and in the pastures the widely varying *sagittata*. *Claytonia Virginica*, well named Spring Beauty, must not be neglected in its moist and generally shady bed.

Along streams in open woodlands, we may find the Spring Cress (*Cardamine rhomboidea*), with large, white flowers; and just shooting up its green stalk, its first cousin the Winter Cress (*Barbarea vulgaris*).

Nor should the floral efforts of trees and shrubs be disregarded. Among the earliest indications of spring the Hazelnut (*Corylus rostrata*) shakes its long catkins along the roadsides, before any signs of swelling leaf-buds are visible, while the Willows (*Salix*), whose name is legion, begin to burst their warm wintry covering. The Savin (*Juniperus Virginiana*) is covered with its curious little flowers. The Hemlock (*Abies Canadensis*) is early in flower, as also the American Yew (*Taxus baccata*). All these require close examination to detect their inflorescence, but well repay it. The two maples, *Acer dasycarpum* (the Silver Maple) and *Acer rubrum* (the Red Maple), hang out their showy pendants very early. The Sweet Gale (*Myrica Gale*), along the edges of swamps, and the Sweet Fern (*Comptonia asplenifolia*), whose dried leaves are the basis of juvenile attempts at smoking, are now in flower; and *Dirca palustris*, well named Leather-wood from the marvellous toughness of its bark, such that it is frequently used in default of leather or twine in repairing broken harnesses or sleds, hangs out its little yellow bells in advance of any leaves.

We close the list with the fragrant Sassafras (*S. officinale*), well known by its aromatic bark and curiously lobed leaves, not so well by its early clusters of yellow flowers, somewhat resembling those of the Sugar-maple; and the Spice-wood, or Fever-bush (*Benzoin odoriferum*), also highly aromatic, and possessing, like the Sassafras, medicinal value as an aromatic stimulant. Such are the earliest flowers,

which in forest, field or fen, invite the search of the botanist and the lover of nature.

Perhaps subsequent articles may give some notes upon the flowers of later spring, summer and autumn, with a floral calendar, and possibly an enumeration of some plants and shrubs well worthy of a place in garden or shrubbery, but hitherto neglected. If this shall succeed in leading any to a closer study of nature's beauty, and the goodness and glory of the Creator, its object will be answered.

THE FRESH-WATER AQUARIUM.

BY C. B. BRIGHAM.

The art of preserving water animals alive and in good condition, as pets or as objects of study, is not of recent date; but the principles of what is now commonly known as the aquarium, were not until lately brought into general notice. The Romans had their tanks of game fish, the English and French gardeners their vessels for the growth of tender water-lilies or other valuable aquatic plants, yet the happy thought of uniting the two,—fishes and plants,—so that the one should balance the other, each aiding in the others support, making withal a collection of such proportions as to be conveniently kept indoors, is the production of comparatively late years.

Dr. Johnstone, of Liverpool, has the reputation of having been the first to apply practically the principles of the aquarium; he made experiments with the *Corallina officinalis*, Starfish, *Confervæ*, and some small plants of the *Ulva latissima*, and found that they flourished for eight weeks without being disturbed; this led him to try some fresh-water fishes and larvæ, and they succeeded even better than the salt-water specimens. Since then Gosse, Hibberd, Warington

and others of England, and the late Mr. Cotting, of Boston, have done much towards forwarding the interests of the aquarium. The whole secret of the success of the aquarium lies in the exactness with which we imitate nature in arranging and disposing our collections; but let us understand first of all that what is meant by the term an aquarium is a collection of water plants and animals, so arranged in suitable ratio that it shall be perfectly self-supporting. We do not expect, then, that the water will have to be changed until after long periods, if at all; the plants and animals should flourish as well as if in their native locality.

How then is this balance of forces to be attained? This leads us to examine the philosophy of the aquarium, which is simply this: The element in water which the fishes live on by breathing is free oxygen, which, as the water is fanned through the gills or lungs of the fish, comes in contact with the walls of its vessels, and arterializes the blood; all water contains a certain amount of this oxygen, sufficient to keep a fish alive for a short time, but if no means are taken to create a fresh supply, it will become exhausted sooner or later, and an escape of carbonic acid will render the water poisonous to the fish. In plants on the other hand we have an agent taking up the carbonic acid in the water, and resolving it into carbon and oxygen, the former of which it converts into its substance, while it expels the latter from every part of its tissue, especially from the leaves in the form of minute bubbles, plainly seen in healthy plants, and so often compared to drops of quicksilver in appearance. It is true that plants absorb oxygen also as fishes do, but they give out so much more than they absorb, that this is of slight account.

Another oxygen producing agent, as was shown by Liebig, is to be found in the almost microscopic forms of animal life which abound in water which has stood for some time exposed to the air. These animalculæ seem to form another link in the chain which binds together all kinds of animal

life of higher or lower order, however apparently diverse they may be. This extra supply of oxygen adds greatly to the support of the aquarium, and is no doubt the reason why a large number of fishes can be supported with a seemingly small proportion of plants. It would indeed be an interesting experiment to try, were we to place a small fish in a large tank, and see if, from the oxygen of these infusorial animalculæ alone, life could be sustained.

It must be the aim of him who wishes to establish an aquarium to see that this balance of plants and fishes is effected, for it is indispensable. Starting then with some idea of what we wish to accomplish, the first inquiry is about the kind of tank we are to use. This is an affair of more than mere fancy, convenience, or economy, for it is important for the growth of many plants that they should have the greatest amount of light possible, and this is especially true with fresh-water plants; so that where a washbowl or a tub would make an excellent tank for a salt-water collection, the same might fail of success in one with fresh-water. Besides there are many specimens which we wish to examine sideways, and obtain that view which it is not possible to have in nature, namely, that of a vertical section of a pond. The requirements of a good vessel or tank for an aquarial collection, are strength and sufficient transparency; these we have in a moderate degree in the inverted bell-glasses, or cake covers, of confectioners. If, however, the glass becomes cracked and broken from any cause, and it is surprising how easily it is broken, the whole collection of specimens is in great danger of being lost, especially if the accident happen in the night-time. Another disadvantage which the cake covers have is, that through them the specimens are sometimes magnified, and irregularly too, so that what has been put into the tank as a very small and finely shaped fish, in an instant becomes a giant more or less deformed. This kind of tank is the usual one adopted by those who are making an aquarial collection for the first time, and it

answers many purposes admirably; it is sufficiently transparent, moderately strong, and quite cheap. One having a diameter of twelve and a half inches, with a depth of eight inches, and of good thickness, can be bought for two dollars and a half; the knob on the top will prevent its standing steadily, and to obviate this difficulty a stand can easily be turned from a block of wood, with a hole cut in the centre large enough to admit the knob, and allow the bottom of the glass to rest upon it as a support. If properly taken care of, a tank of this sort will last for years, and be a great comfort to its possessor, but an untimely accident will before long induce him to try something more substantial.

Perhaps the best tank for the aquarium in use is what is called a rectangular tank, having the four sides of glass, and the base of some hard material such as stone, iron or wood. The glass is held in place, and supported at the four corners by as many pillars of iron or wood, which are held together on top by strips of a similar material connecting them. Of the three materials for the base and pillars, iron is by far the best for a fresh-water tank, if we can have but one material alone; it is lighter than stone, and the little it rusts from time to time does not amount to anything; the water does not ooze through it as it does through some kinds of stone, and it does not warp, as wood is so apt to do if the tank is left without water for a length of time. To prevent rusting a layer of cement may be spread on the bottom of the tank inside, and a plate of thick strong glass placed upon it; and in the same way a narrow strip of glass can be cemented to each of the pillars, so that the iron shall be prevented from coming in contact with the water at every point. A tank, having a base of slate and pillars of iron protected by glass, as just explained, is the best kind of a tank to own, as it can be used for either salt or fresh water as we require. The shape of a tank, too, is of some importance, that of a double cube being the best for this reason, that it allows more of a clear surface on the long sides for inspection after the rock-

work and plants are introduced, than a tank whose shape is square; it also gives a better chance for the light to strike upon every point inside.

The facilities for procuring tanks already made are so great nowadays, that while once it was an object to know how to construct a tank for one's self, now one has only to make a choice from several patterns. The most important thing to look after in selecting a tank, next to its material and shape, is the kind of cement which has been used; all sorts of putty are to be rejected as worthless; if we cannot be sure that the cement is good and not injurious to fishes, a few weeks trial, or even less, will convince us of its value. Another point to be attended to, is that the cement be quite hard before the tank is filled with water, as there are some kinds of cement used that never harden; of course, in these cases there is danger of having a leaky tank to contend with.

Of the other kinds of tanks, either those made wholly of clay, or of glass, or those with one side at an angle of 50° with the base, so as to form a beach, after the pattern of the Warington tank, or those with all the sides of slate, in imitation of a rock pool, or those of an oval or hexagonal shape, each has its advocates. Some tanks have been lately made in New York, with the base and pillars of a composition which is silver-plated; they are wonderfully light and beautiful, but there seem to be doubts as to their durability. More or less ornament can be displayed on the pillars and base of the tank, according to the taste of the owner, but it seems as if simplicity and neatness were full as requisite here as elsewhere, and that the ornament of the tank should be the collection inside. As to the size of the tank, it very much depends on the place one has to put it in. These three sizes I have found from experience very useful:

No. 1, Length, 18 in.; depth, 10½ in; width, 12 in.

No. 2, Length, 24 in.; depth, 14 in.; width, 14½ in.

No. 3, Length, 28 in.; depth, 13½ in.; width, 13 in.

Number three is, perhaps, the best size of all, and it is by

far the prettiest shape. Tanks can be purchased, generally, at the bird or plant stores of large cities; the prices range from six dollars upwards. Sometimes a stand for the tank is made in connection with it, or of a similar material. It is well to remember in selecting a stand, the enormous weight which it will have to bear when the tank is filled with stones and water. — *To be continued.*

HINTS ON TAXIDERMY.

BY C. A. WALKER.

Equipment for the travelling collector. — The travelling collector should equip himself with a double-barrelled gun (and a rifle when large animals are sought for), ammunition, including shot for small birds and mammals (numbers 2, 6, 8, and 10, — the latter should never be omitted); dissecting instruments, scissors, needles and thread, preservative drugs and preparations, and alcohol about 80 per cent. in strength; tin cans of various sizes for containing alcoholic specimens, since glass bottles and jars are liable to be broken during transportation; cotton and tow for stuffing the skins of birds and mammals; fishing lines and hooks, casting net, a seine for catching fishes in small streams, the two ends of which should be secured to long wooden handles, which are held in the hands of two persons upon opposite banks; in this position it can be drawn both up and down the stream. He should also carry with him a geological hammer and steel chisels for collecting fossils and rock specimens, and small pocket vials and cork-lined boxes for insects.

Preservatives. — Common powdered arsenic should be employed for skins to be mounted at once, instead of arsenical soap, as it has a tendency to dry them quickly. It may be applied dry, or mixed with alcohol until it is of the consist-

ency of syrup; in the former case it should be dusted upon the skin by means of a small sieve; in the latter it is necessary to apply it with a brush. Arsenical soap should be used only upon skins which are intended to be kept for a long time before being mounted. It is composed of the following ingredients: powdered arsenic ½ lb., camphor 1¼ lb., salts of tartar 3 oz., powdered lime 1 oz., bar soap ½ lb.

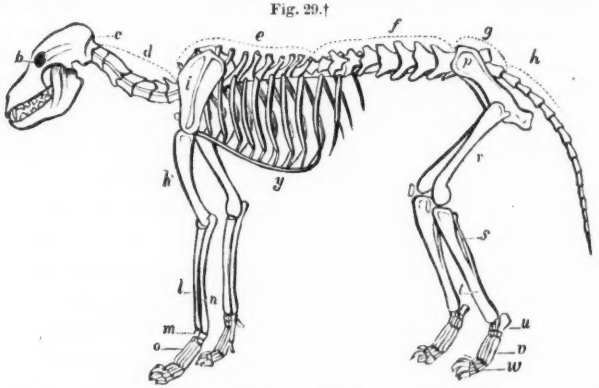
The soap should be cut into very fine slices, put into a tin dish with warm water, and stirred over a moderate fire until thoroughly dissolved; the powdered lime and salts of tartar should then be added and mixed with the soap. The preparation should next be removed from the fire, the powdered arsenic, and lastly the camphor (powdered and dissolved in a little alcohol) added, stirring the mixture all the while. The whole should have the consistency of flour paste; if it be too thick add a little water, taking care not to hold it over the fire after the camphor has been added, as heat will cause the latter to evaporate speedily. After cooling it place it in a jar with a brush passing through the stopper, and label the jar "*poison*." In extreme cases when the above preparations cannot be obtained, the skin should be rubbed with salt or with alum, or filled with spices and strong smelling herbs. These are by no means a substitute for arsenic, and are to be used only when the latter cannot be obtained. The skins of large animals should be soaked in a solution of alum, arsenic and salt, or in weak arseniated alcohol for several days.

Directions for preliminary work.—When a specimen has been killed the mouth should be opened, cleaned and filled with cotton or tow; the nostrils and vent, and any wounds should be treated in the same way to prevent blood or other secretions from exuding. It is essential to remove the skin as soon as possible after death. Should this be inconvenient, the internal organs should be taken out and the cavity filled with powdered charcoal if it can be had, if not, salt should be used. Previous to removing the skin, an accurate meas-

urement should be taken of the subject in the manner indicated below.*

The color and general character of the hair, as well as any change of the same at different seasons of the year, the sex, and any other peculiarity known should be carefully written

Fig. 29.†



down and preserved. Skins should never be packed for transportation until thoroughly dry; they should then be placed in a box containing plenty of camphor, having its sides and joints perfectly closed with pitch to prevent the invasion of insects. It is well to saturate the inside of the box with benzine before placing the skins within. Never allow a box containing skins to be placed in any damp place.

Instruments and materials used.—Of instruments and materials useful to the taxidermist in mounting mammals, birds, fishes and reptiles, the following are needed: A scalpel

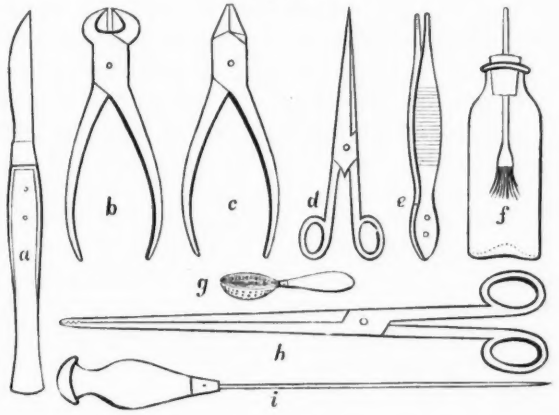
*The following are the general measurements which should be taken of a quadruped:

Total length; nose to occiput; nose to eye; nose to ear; nose to end of tail; length and width of ears; tail from root to end of vertebræ; tail from root to end of hairs; length of the different joints of the forelegs; length of the different joints of the hind legs; forefeet from wrist; hind feet from heel; length of toes; length of nails.

†Explanation of Fig. 29:—*b*, eye; *c*, occiput; *d*, cervical vertebræ; *e*, dorsal do.; *f*, lumbar do.; *g*, sacral do; *h*, caudal do; *i*, scapula; *k*, humerus; *l*, radius; *n*, ulna; *m*, carpal bones; *o*, metacarpal bones; *p*, pelvis; *r*, femur; *s*, fibula; *t*, tibia; *u*, tarsal bones; *v*, metatarsal bones; *w*, phalanges.

(Fig. 30, *a*); a pair of pincers for bending wire (*c*); a pair of wire cutters (*b*); a pair of small forceps for stuffing the necks of *small* birds and mammals and arranging feathers (*e*); a pair of larger ones, at least fifteen inches long, for stuffing the necks of *large* birds and mammals (*h*); a pair of dissecting scissors for cutting flesh and ligaments during the process of skinning (*d*); another larger and stronger pair for cutting tow; a large knitting needle inserted into a handle and sharpened at the end, for perforating the tarsi of birds previous to the insertion of the wires (*i*); a tin sieve with a cover for dusting powdered arsenic upon the skin (*g*); a wide-

Fig. 30.



mouthed jar, with a brush passing through the stopper, for holding arsenical soap (*f*); tow for stuffing small birds and mammals (the finest quality being used for filling the necks); also hay, dried moss, etc., for those of larger size; needles for sewing up incisions; thread for winding; a large fish-hook with the barb filed off, for suspending specimens while skinning them. Annealed iron wire of various sizes, varying from 10 to 26,—No. 10 being used for supporting large specimens, No. 26 for humming birds, warblers, etc. A flat file of medium coarseness for pointing wire; a set of Aiken's

tools, containing various sizes of bradawls; a small gouge, chisels, etc., will be found very useful.

Method of skinning a mammal.—When an animal is ready for skinning, the mouth, nostrils and shot holes, should be filled with cotton or tow. Place the animal upon its back, take the scalpel in the right hand and with the left separate the hair to the right and left in a line from the front of the pubis quite down to the vent, so that the skin beneath can be plainly seen. Make a longitudinal incision along the course, directed in as straight a line as possible, taking care not to cut so deep as to expose the intestines. The skin should then be turned back on either side with the aid of the scalpel, working downward toward the back. When the thigh has been laid bare sever it from the pelvis at its junction with the femur or thigh bone. Layers of cotton or tow should, from time to time, be placed between the skin and body, as it will prevent the hair from being soiled. This operation should be repeated with the other side. Next the intestinal canal should be cut off a little way above the anus, and the tail separated close to the body. The skin should then be loosened from the back and breast until the forelegs are visible. Sever these at the shoulder joint or the base of the humerus. Remove the skin from the neck and the back part of the skull will appear. In skinning over the skull, care should be taken to sever the ears as close to it as possible; also not to injure the eyelids or cut too close to the lips. The carcass should next be separated from the skull at the first vertebræ, or the junction of the skull and neck. The next operation is to remove the tongue, eyes, and all the muscles attached to the head. Through an opening in the occipital bone, carefully clean out the brain. Next the legs should be skinned quite down to the claws of the feet, removing all muscles, but leaving the ligaments and tendons of the knees. The hind legs should undergo the same operation. Lastly, skin the tail as far back as the first three joints of the vertebræ, and to this stump fix a

stout cord, which should be fastened to a hook or other projecting object on the wall. A strong piece of wood is then prepared, flat, and sharpened upon both edges. This should be introduced between the skin and the vertebræ, and by working it around the latter, the attachments will be severed and the vertebræ within can be easily pulled from the enveloping skin. In skinning the tail of the beaver an incision should be made upon the under side, running lengthwise from the base to the tip. The skin should then be loosened, beginning upon either side of the incision, until the flesh is entirely free, when it can be removed, the arsenic added, the skin restored to position, and the incision sewed up.

The foregoing method is practiced only upon the smaller quadrupeds; with the larger mammalia a different course is pursued. An incision is made from beneath the under jaw, in a straight line to the anus; transverse cuts are also made, running down the inside of both fore and hind legs. These being made upon the inner side will render the seams less conspicuous after the specimen has been mounted. To detach the hoofs, place them upon a stone and strike them repeatedly with a mallet; they will soon loosen and can be separated from the bone. After the operation of skinning has been completed, every part of the skin should be anointed thoroughly with arsenical soap. Turpentine applied to the nostrils and lips will prevent the approach of noxious insects. When the skin is too large for the application of the soap, it should be thoroughly saturated with a solution of "alum and water." The different bones left in the skin should all be thoroughly anointed with the preservative, and the eye-sockets and cavity of the brain filled with cotton or cut tow before replacing the skull in its natural position. If the animal be not too large the carcass should be preserved, as it will greatly aid the operator in his work of modelling a body. If immersed in alcohol, it can be kept any length of time.

To mount the skin; for instance that of a squirrel.—First

provide yourself with tow, cotton, thread and twine; also, the stuffing forceps, a pair of pincers, file and wire cutters. With the aid of the forceps supply the various muscles of the face and head, by inserting cotton both through the mouth and eyelids. Take annealed wire of the proper size, and cut from the coil six pieces: No. 1, two or three inches longer than the total length of the body; Nos. 2 and 3 for the forelegs; Nos. 4 and 5 for the hind legs; each of these should be two, or even three inches longer than the limbs they are to support; No. 6, for a support to the tail, of the same proportionate length as the others. With a large pair of scissors, cut fine a quantity of tow, and with this, and the aid of the long forceps, stuff the neck to its natural dimensions. Taking wire No. 1, bend in it four small rings, the distance between the two outer representing the length of the body taken from the skin (Fig. 31, *a*), leaving one long end for a support to the head and neck (*b*). Mould tow about that part containing the rings, and by winding it down with thread, form an artificial body, resembling in form and size the natural one taken from the skin. Sharpen the projecting end to a fine point with the file,

Fig. 31.

and insert it up through the cut tow in the neck, and thence through the skull; the skin should then be pulled over the body. Wires Nos. 2 and 3 should then be placed in position, by inserting them through the soles of the feet, up within the skin of the leg, and through the body of tow, until they appear upon the opposite side. With the pincers bend over the end of each, forming a hook; the wires must then be pulled backwards, thus fastening the hooks firmly into the body. The loose skin of the limbs should then be stuffed with cut tow, taking care to imitate the muscles of the living subject. Nos. 4 and 5 can be fixed in position after the same manner, except if the animal is to rest entirely upon its tarsi (as in

the case with the squirrel when feeding), then the wire must be inserted at the tarsal joint instead of the sole of the foot. If any depressions appear in the skin they must be stuffed out with the cut tow. Wire No. 6 should now be inserted at the tip of the tail, and forced down within the skin, hooking it into the body in the same manner as the leg wires. Stuff the tail to its proper dimensions, with cut tow, and carefully sew up the incision along the abdomen. Having prepared a board about three-quarters of an inch thick, pierce in it two holes at a proper distance apart for the reception of the leg wires (four holes would be needed if the animal were to stand upon all extremities); these must be drawn through upon the under side until the feet of the specimen rest close upon the upper surface, then they should be clinched, taking care that the wire does not protrude above the surface of the board as it renders the support unsteady. The different joints of the limbs can now be imitated by bending the wire at the proper points; also, a curve can be given to the back, and the tail can be set into proper position by simply bending the wires into the required shape. The eyes should now be placed in their position, a little putty having been previously inserted within the eyelid to serve as a cement. Care should be taken in arranging the eyelid, for the expression depends altogether upon this point. Clip off any superfluous wire which may extend above the head with the wire cutters. The specimen should then be placed in some locality free from moisture and allowed to dry thoroughly, when it is complete for the cabinet.

In mounting quadrupeds of large size the following formula should be pursued:—Procure a bar of wood, an inch thick and two inches broad, of a length equal to the distance between the shoulders and thighs; this should be placed within the skin, three holes having been previously made at one end, and two in the other, with a gimlet, for the reception of the various wires. This is used as a

substitute for the central wire or body support. Having sharpened a piece of wire large enough to firmly support the specimen, force it down through the skull and neck, passing it through the gimlet hole at *a* (Fig. 32); when it appears on the under side bend the end into the form of a hook with the pincers, and drive it firmly into the wood. Next, the foreleg wires, well sharpened, should be forced up through the soles of the feet, and fixed into the bar of wood at *b* and *c*, in the same manner as the head support. Do the same

Fig. 32.

with the hind leg wires, fastening them at the lower part of the bar, as at *d* and *e*. Lastly, the tail support should be placed in position, fastening it to the wooden bar at the point *f*. This completes the framework. A quantity of hay or moss should now be procured, and it is of the utmost importance that it should be thoroughly dry, otherwise the specimen is liable to mould. Commence filling the neck, keeping the wire in the centre of the material, and stuff downward to the forelegs; these should then be restored to form, taking care to imitate the muscles of the shoulder. In working down the body place the hay or moss between the bar of wood and the skin to avoid all stiff appearance; always place the stuffing material evenly within the skin, and never use pressure, as a fresh skin can be easily expanded far beyond its natural dimensions. Having reached the hind legs, imitate faithfully, by stuffing, all the natural muscles. When this part has been completed, sew up the various incisions; attention should be paid to separating the

hairs, and not to take any of them in along with the thread. Imitate the joints of the limbs by bending the wire at the proper points, and place the specimen upon the board, draw the wires through the holes with the pincers, and clinch them upon the under side. The specimen will then assume an erect position. The orifices of the eyes, mouth and ears, should be filled with cotton saturated with the preservative, and the artificial eyes put in while the eyelids are yet pliable. The lips can be secured in their proper position by means of pins, and the nostrils distended to their natural size, with pellets of cotton inserted within. In the larger mammalia the orifices of the head should always be anointed with *spirits of turpentine*. If any irregularities appear in the skin, they must be pressed down and modelled into shape with the hand. The muscles of the various parts of the body can be exactly imitated by making casts of plaster of Paris, and fitting them within the skin in lieu of other stuffing material.

Those gigantic beasts which roam about the forests of tropical countries, such as the elephant, giraffe, etc., have to be mounted upon wooden models. Perhaps the method cannot be better illustrated than by giving an account of the manner in which an elephant was mounted at the Jardin du Roi, at Paris, as related by Capt. Thomas Brown, F. L. S., in his work entitled "The Taxidermist's Manual:"

"The dead elephant being extended on the ground, the dimensions were all taken and correctly noted at the time. M. Lassaigne, cabinet-maker to the establishment, invented a large rule for that purpose, which was somewhat like a shoemaker's size-stick. The different curves of the back, belly, neck, etc., were taken by bars of lead, of three-quarters of an inch in thickness. This metal is much better adapted than any other for that and similar purposes; as it has no elasticity it retains any shape into which it is put. M. Demoulins made a drawing of the animal from these measurements, on the wall of the workshop where the model was constructed, of its natural size. The elephant was placed upon its back by means of four-corded pulleys fastened to the platform. An incision, in the form of a double cross, was then made in the lower side, the central line reaching from the mouth to the anus; the two cuts were made from the left leg, on both sides, to the opposite right legs. The trunk was

longitudinally opened on its under side; the soles of the feet were now taken out to within an inch of their edge, and the nails allowed to remain attached to the skin. This was effected by the aid of a chisel and mallet, and was one of the most difficult operations of the whole. Several persons wrought at a time at the operation of skinning, and four days were necessary to effect it. When removed from the carcass, the skin was weighed, and found to be five hundred and seventy-six pounds. It was extended on the ground, so that the cutaneous muscles of the head and other parts might be cut away from its interior. The skin was then put into a tub, and covered six inches deep with water which had been saturated with alum. The model which was to fill the skin was made as perfect as possible in its shape. To insure this, models were made of half the head in plaster, as also a fore and hind leg. This structure was made of linden wood, and so ingeniously constructed by M. Lassaigne, that almost the whole parts could be separated. He opened a panel on one side of the body, whereby he introduced himself into its interior, so that he might make its parts more perfect within. Even the head and proboscis were hollow, which rendered this stupendous model so light that it could be moved from one place to another with comparative ease. The model being completed, the alum water, in which the skin had been all the time immersed, was now taken out and made boiling hot, and in that state poured on the skin, which was then allowed to soak in the warm liquor for an hour and a half, when it was taken out, still warm, and placed upon the model, which was accomplished with some difficulty. But judge of their own mortification when it was found that the model was rather too large. To diminish the woodwork they foresaw would run the risk of putting its parts out of proportion. It then occurred to them that the best thing to be done under these awkward circumstances was to take off the skin again, and reduce its thickness with knives; they removed all the internal thickenings which came in their way. In this operation five men were occupied for four days, during which time they cut out one hundred and ninety-four pounds weight off the internal surface. During this process the skin had dried, and required again to be immersed in cold soft water; after allowing it to remain twenty-four hours to soak, it was then put on the model, and found to cover it completely; the edges were brought together and secured with wire nails, deeply driven home, and large brads. Except at the edges, the nails and brads were only driven in half way, to keep the skin down to the different sinuosities and hollows until dry, when they were again all pulled out. The alum with which the water was saturated gave the skin an ugly gray appearance from crystallization. But this was soon remedied, by first rubbing the skin with spirits of turpentine, and afterward with olive oil. By the admirable and well executed contrivance here adopted, a specimen has been mounted with all the appearance of life, which, with a little attention, may resist for ages the influence of time."

[*To be Continued.*]

REVIEWS.

THE ORIGIN OF GENERA.*--In this essay the author does not consider that generic and specific characters are identical. He divides animals into numerous series, specific, generic and so on, in which the lower members of each form the progressive steps, with the exception of course of the specific series. "The lowest or most generalized terms or genera of a number of allied series, will stand to each other in a relation of exact parallelism. That is, if we trace each series of a number, up to its lowest or most generalized genus, the latter together will form a series similar in kind to each of the sub-series, *i. e.*, each genus will be identical with the undeveloped conditions of that which progresses the farthest, in respect, of course, to the characters which define it as a series." Cases of exact parallelism are accounted for by the law of "retardation and acceleration," which is claimed to be "a continual crowding backwards of the successive steps of individual development, so that the period of reproduction" "falls later and later in the life history of the species, conferring upon its offspring features in advance of those possessed by its predecessors."

Prof. Cope here points out a parallel between the development of the individual and of the genus of great interest and novelty. "As one or more periods in the life of every species is characterized by a greater rapidity of development (or metamorphosis) than the remainder, so in proportion to the approximation of such a period and the epoch of maturity or reproduction, is the offspring liable to variation. During the periods corresponding to those between the rapid metamorphosis, the characters of the genus would be preserved unaltered, though the period of change would be ever approaching." "As the development of the individual, so the development of the genus. We may add so the development of the whole of organized beings."

After stating that as a rule animals exhibit in course of development certain specific, before they do generic, characters, the author says: "Apart from any question of origin, so soon as a species should assume a new generic character, it ceases, of course, to be specifically the same as other individuals which have not assumed it. If supposed distinctness of origin be, however, a test of specific difference, we shall then have to contend with the paradox of the same species belonging to two different genera at one and the same time." Several instances then are brought forward to prove the proposition "that the nearest species of adjacent genera are more nearly allied in specific characters than the most diverse species of the same genus," and, also, that like varieties of distinct species are much nearer in shape and appearance than unlike varieties of the same essential species." In course of time a series is formed in which

* The Origin of Genera. By Prof. E. D. Cope. Philadelphia. 8vo, pp. 80. $1.25.

the adult characteristics of the original genus are reduced to a larval condition, but the original genus still continues to "accelerate" its own development, though more slowly, and finally reduces its original characteristics also to a larval condition, and acquires in the adult state different characteristics from the first series.

This, with other confirmatory evidence, renders it probable that generic changes may simultaneously take place in a number of species without the loss of their specific characteristics, and in the same way genera may be simultaneously transferred from one suborder to another without the loss of their generic characteristics. The development of generic characteristics thus appears to be governed by a law which is not dependent upon physical surroundings. Species on the other hand, though they "exhibit a proportion of characters which are the successive stages of that one which progresses farthest," yet "the majority of specific characters are of divergent origin, — are "morphic as distinguished from developmental." Thus specific characteristics are essentially adaptive, and therefore due mainly to natural selection. The author's conclusions are given in six propositions, from which we quote the two given below:

I. Species have developed from preëxistent species by an inherent tendency to variation, and have been preserved in given directions and repressed in others, by the operation of the law of Natural Selection.

II. Genera have been produced by a system of retardation or acceleration in the development of individuals; the former on preëstablished, the latter on preconceived lines of direction. Or in other words, while nature's series have been projected in accordance with the law of acceleration and retardation, they have been limited, modified and terminated by the law of natural selection, which may itself have operated in part by the same law.

An Illustrated Work on the Butterflies of New England. — Mr. Samuel H. Scudder will publish during the coming winter, a large and expensively illustrated work upon New England Butterflies. He will give, as far as possible, a complete history and description of each species during every stage of its existence; tables and descriptions of genera will be introduced, together with a preliminary chapter upon the general structure of butterflies, which will serve as a guide to their careful study; their geographical distribution, both in and out of New England, will be largely discussed, and the book virtually form a manual for all the Northern United States; it will be generously illustrated by colored plates of every species, done in the highest style of the art.

To make the work as complete as possible, the author invites the assistance of entomologists in obtaining living or fresh specimens of eggs, larvæ and pupæ, for illustration and study. Without such assistance it would be impossible, in a single summer, to obtain all the requisite material. Full credit will be given in the book for every item of assistance rendered.

The success with which Mr. Saunders, of Canada, has reared butterflies in their earlier stages, ought to encourage our friends to similar

efforts. Mr. Saunders' method is to confine each female butterfly in a small, dark box, — a pill box for example, — in which she is obliged to deposit her eggs; he endeavors, before the eggs are hatched, to notice what plant the butterfly seems to affect; the young larvæ are fed upon it, and, in many instances, successfully reared.

As careful descriptions of these larvæ and pupæ cannot be prepared without many specimens, and as we have so little accurate knowledge of the earlier stages of our native butterflies, our friends need not fear to send Mr. Scudder all the specimens they can find. If possible, they should be sent alive, so as to secure good colored drawings of each species; the larvæ should be accompanied by fresh, moistened leaves of their food plant for nourishment on the journey, and forwarded by mail in small, light, but strong boxes (tin is preferable), to S. H. Scudder, Boston Society of Natural History, Berkeley street, Boston, Mass., marked in addition, *Insects*. This latter precaution is necessary, because, in case of a temporary absence from the city, Mr. Scudder will leave directions to have boxes thus marked, sent at once to his artist. The specimens should be accompanied by the name and address of the sender, and, when known, the name of the insect and of the plant on which it feeds. When it does not seem practicable to forward them alive, they may be sent in small bottles of glycerine, or in a mixture of one part pure carbolic acid (Squibb's preparation), and twenty-four parts water. In this case also they should be sent at once and by mail, that the colors may be seen before they fade. When neither of these methods is possible, spirits may be used, but the colors will soon be lost. If any one obtains a number of eggs and is able to raise them, it would be best to forward, from time to time, two or three specimens both of the eggs and chrysalids, and the same number of *each moult* of the larva; the butterfly which has laid the eggs should always be preserved, and forwarded with the larvæ, etc., for satisfactory identification. If any one is in doubt about the food plant of some insect which he has found, it would be best to write a letter of enquiry to Mr. Scudder, who will be glad to answer any questions.

Those willing to assist in this work should commence at once to trace the history of the Theclæ and Lycænæ, of which almost nothing is known. The former feed upon various trees and shrubs, such as the oak, thorn, willow, pine and cedar, and also on the hop-vine; the latter upon different kinds of herbs, as Lespedeza, etc.

The author trusts that those who live outside of New England, will remember that he must depend absolutely upon them for information concerning the earlier stages of those insects which are very rare in New England, but common with them. Any assistance that they can render him will be most gratefully received.

The Kingfishers. — A monograph of this beautiful family of Birds is now being published by Mr. R. B. Sharpe, of the Zoölogical Society of London. It will be issued in twelve to fourteen parts, imperial 8vo, each part to contain eight beautifully colored lithographic plates. All the species

of Kingfishers known (about one hundred) will be described and figured, and Dr. Murie will furnish a chapter on the anatomy and osteology of the family. Only two hundred copies of the work will be printed: three parts are already issued. The price to subscribers will be about $5.00 a part, delivered in this country. The work is worthy of support by the ornithologists of this country, and we should be happy to take subscriptions for the author. The price will be advanced one-fifth after the work is out.

BULLETIN OF THE ESSEX INSTITUTE.*—This new publication of the Institute is one of the results of the changes that have taken place owing to the formation of the Peabody Academy of Science, and the transfer of the Scientific Museum of the Institute to the charge of the Academy. In great part the "Bulletin" will take the place of the "Proceedings and Communications" of the Institute, which will be discontinued after the publication of Volume *six* (now in press), which will bring the Proceedings up to the month of January, 1869, at which date the "Bulletin" commences.

The "Bulletin" will contain an account of the proceedings at each meeting of the Institute, and the lists of donations, etc., made to the library of the Institute, and to the Museums of both the Institute and the Academy. It will also contain short lists of the deficiencies in the library of the Institute, and of duplicate books offered for sale and exchange, but by far the greater part of each number will be devoted to the short communications read at the meetings, and of general interest, while the longer historical papers will be printed as heretofore in the "Historical Collections," and the purely scientific communications will be offered to the Academy for publication in its Memoirs. It will thus be noticed that the "Bulletin" will take the place of the "Proceedings," while the Memoirs of the Academy will correspond to the former "Communications" of the Institute.

The first number of the "Bulletin" contains, among other interesting papers, the remarks made by Prof. A. M. Edwards at a recent meeting, on Guano, in which Prof. Edwards advances the theory that guano is not the droppings of birds, as has generally been supposed, but is the deposit of the remains of dead animal and vegetable matter at the bottom of the ocean, which, as the coast rose, had been so lifted as to appear on the crests of the islands formed, and from the chemical changes it had undergone, had become guano. Among other facts brought forward to prove his theory, he mentioned that an island had risen at the Chincha group, which contained guano on its summit at the time of its uprising. He also alluded to the fact that the droppings of birds would be quite inadequate to supply the vast amount of guano found, and that such droppings were chemically distinct from guano.

The first and second numbers of the "Bulletin" contain obituary notices of our late associate, Horace Mann, and of the distinguished ornithologist, John Cassin.

*8vo, 16 to 20 pages. Issued monthly. Price 10 cents single copy. Subscription $1.00 a year. Essex Institute Press.

THE CRANE-FLIES OF NORTH AMERICA.*—Another of the useful entomological works issued by the Smithsonian Institution, is Baron Osten Sacken's elaborate Monograph of the North American Tipulidæ (or Crane-flies), with short palpi, comprising the smaller species of the family; the true Tipulids comprising the well-known crane-flies so abundant in our gardens and fields. This work, destined, we judge, to be a classic in American entomological literature, is useful not only as containing descriptions of all our known crane-flies, but as a model of the mode of monographing a group of animals; and for patient research, thorough treatment and the new mode of illustration (heliographs by Egloffstein's patent) is one of the most important works on insects published during the past year in any language. It will be noted at greater length in the "Record of American Entomology" soon to be published.

REVISION OF THE LARGE, STYLATED, FOSSORIAL CRICKETS.—In the first number of the *Memoirs of the Peabody Academy of Science*,† Mr. S. H. Scudder has brought under review all the species of the palmated crickets known to him, with the exception of the smaller forms. The descriptions of the species are carefully prepared, and each description is accompanied with a full table of measurements of several specimens. The plate contains a full-sized figure of *Gryllotalpa australis*, from New Holland, a species never before figured; and thirty-seven details of forelegs and wing-covers of the different species.

The author has prefaced his own descriptions with a full list of the various writers on the group, with remarks on the species mentioned by each. The Mole Crickets which are furnished with but two dactyls on the fore tibia, he places together as forming a new genus, to which he gives the name of *Scapteriscus*, while for those having four dactyls, he retains the old generic name of *Gryllotalpa*.

THE NOXIOUS INSECTS OF MISSOURI.‡—This first report of the State Entomologist is exceedingly creditable both to the author and the State which has so liberally fostered the study of economical entomology. Farmers and gardeners throughout the country will find it a very readable book, and entomologists will glean many new facts from its pages. The chapter on Cutworms, Bark-lice, the Plum-curculio, the Seventeen-year Cicada, the Potato-beetles and the Bot-fly of the sheep, are of especial interest.

We learn that the State of Missouri has acknowledged the value of the study of practical entomology, by the appropriation of $3000 to pay the salary of the Entomologist for the present year. In such a liberal provi-

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*Monographs of the Diptera of North America, Part. IV. (Smithsonian Miscellaneous Collections, 219). Prepared for the Smithsonian Institution by Baron Osten Sacken. Washington, Jan., 1869. 8vo, pp. 345, 4 plates.

†Imperial 8vo, 32 pages and steel plate; tinted paper. Salem: Essex Institute Press. March, 1869. Price $1.25.

‡First Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri. By Charles V. Riley, State Entomologist. Jefferson City, 1869. 8vo, pp. 190, with two colored lithographic plates and ninety-eight cuts, $2.00; with plain plates $1.00.

sion for the diffusion of entomological knowledge, Missouri not only leads all the States in the Union, but shows that she regards it as an economical measure to induce every farmer to be his own entomologist.

GUIDE TO THE STUDY OF INSECTS.* — The sixth number of this work is out, and contains accounts (not before published) of the transformations of twelve moths injurious to fruits, etc., mostly illustrated, besides notices of the Clothes' Moth, Carpet Moth, Grain Moth, the Angoumois Grain Moth, etc., with full directions for collecting the smaller moths. The chapter on Diptera is begun, and gives accounts of the Mosquito, the Wheat Midge, Hessian Fly and Gall Flies. The number contains a steel plate figuring forty different objects, and fifty-seven cuts in the text. We should here state that the *Penthina vitivorana* feeds exclusively on the grape seed; it rolls up the leaf when about to transform, but does not *feed* upon it. Lines eight and nine from the bottom, on page 336, may therefore be deled.

LE NATURALISTE CANADIEN.† — A capital journal for the popularization of natural history among the French Canadians. It is edited with much spirit, and we trust that its success is already assured.

TERATOLOGY. — M. C. Dareste has given us in the "Annales des Sciences Naturelles" a résumé of his remarkable discoveries, from which we translate a few paragraphs as nearly word for word as possible:

"I at first sought to obtain monstrosities, as Geoffroy Saint-Hilaire had done, by submitting eggs placed vertically or partially varnished to artificial incubation." "Later I recognized the fact that these two causes which I had set in operation were not the only ones which acted upon the embryo, and that it was necessary also to take account of another cause to which I had not at first attended; that is to say, of the manner in which the eggs were heated in one of the artificial 'couvenses,' which have served for my experiments. I have therefore, provisionally, abandoned the use of varnish, and the vertical position, in order to employ only a single cause of modification, the use of which I could perfectly control." When the egg is covered with varnish or other glazing, which partially excludes the air, the embryo can develop, but finally perishes when the allantois is formed "when the needs of respiration imperiously demand greater quantity of air." "I arrive now at the results which depend upon the mode of warming the eggs in one of my artificial brooding hens (couvenses). In this apparatus the contact of the egg with the source of heat takes place by only one point. Now if in place of directly warming the culminating point of the egg, the point which the cicatrix always occupies at the end of the development, a point of the egg situated at a certain distance from the preceding one be heated, the development is

* Published at Salem, Mass., by A. S. Packard, jr. Fifty cents a part. To be published in ten parts.

† Le Naturaliste Canadienne. Bulletin des Recherches, Observations et Decouvertes se rapportant a l'histoire naturelle du Canada. Tom. I, nos. 1-4, 1869. Quebec. 8vo, $2.00, gold, with illustrations.

disturbed, and an anomalism is always produced, which manifests itself in the form of the blastoderm at first, and then in that of the vascular area. In fact, under these unusual conditions, the development of the cicatrix takes place more rapidly in the region lying between the culminating point of the egg, and the point of contact with the source of heat, than in the opposite region. On this account (Il en résulte qui) the blastoderm at first, and then the vascular area assumes an elliptical form, and the embryo is produced in one of the foci of the ellipse; while in its normal state the embryo occupies the centre of a perfectly circular blastoderm and vascular area. This result is very distinct, so distinct that allowing for the primitive eccentricity ("l'orientation") of the embryo, and giving to the egg a certain position with respect to the source of heat, this excess of development of a part of the blastoderm may be directed where it is desirable, either to the left or the right of the embryo, either above its head or at its caudal extremity."

"The embryos which appear in the blastoderms thus formed are very frequently monstrous. I cannot say in what proportion however, since I am often obliged to study them at an epoch anterior to the appearance of a monstrosity, and I cannot therefore predict what would have taken place if incubation had been continued. However this may be, I have thus been able to observe almost all the types of simple monstrosities at different epochs in the formation of the embryo, and consequently to bring together the materials of teratological embryogenesis.

"And, first, I have established a very general condition of the formation of the greater number of monstrosities, of those at least which profoundly modify the organization; it is that they appear early, and during that period of life when the embryo is reduced (reduit) to a homogeneous matter, when the general form of the body, and the special form of each organ is sketched out before the appearance of definite histological elements." "Celosoma, Exencephalus and Ectromelia, so different in appearance, but which are almost always associated, have for a common condition an arrest of the general development of the amnios, which does not complete itself always in front, leaving thus the umbilical opening more or less open, and which (the amnios) completing itself only slowly behind, remains for a greater or less time in contact with certain parts of the embryo, which it submits to constant pressure. From this there results a certain number of deviations and atrophies in the regions of the body submitted to pressure.

"Symelia, which has been hitherto considered inexplicable, results from an arrest in development of the caudal hood of the amnios which forces the posterior members, at the moment of their appearance, to reverse themselves backwards, to come in contact with each other by their external edges, and to unite themselves in this universal position. Anencephalism has in the beginning hydropsy of the vesicles which are the first state of the encephalic organs. This hydropsy is found equally in the amnios, and sometimes, indeed, in the whole thickness of the tissues, which then present a general œdema, the result of a peculiar state of the

blood which is completely colorless, and contains only very few globules. The want of globules in the blood has its rise in an arrest of development of the vascular area, which is only very imperfectly furnished with canals, and which presents the blood globules imprisoned in the isles of Wolf (îles de Wolf).

"The inversion of the viscera results from the unequal development of the two cardiac blastemæ, which, as I have discovered, precede the formation of the heart. In its normal state the right cardiac blastema is more developed than the left, and determines ulteriorly the incurvation of the cardiac arch more to the right of the embryo than the returning of the embryo (heart) upon the left side. During inversion, the left cardiac blastema develops itself more than the right, from which results the incurvation of the cardiac arch to the left of the embryo, and the return of the same upon the right side. The existence of two hearts, an anomaly unknown to Geoffroy Saint Hilaire, which M. Panum described some years since, and which I have had occasion to observe several times, results from an arrest of development which prevents the junction of the two primitive cardiac blastemæ. Cyclopia results from an arrest of development which prevents the two ocular blastemæ, primitively in contact, from separating themselves. This arrest of development is very probably in consequence of an arrest of development of the cephalic cap of the amnios; but I have not yet been able to establish this last fact with certainty." In fact I have seen that the inversion of the viscera may be obtained when, in one of the malformations of the blastoderm previously indicated, the left region of the vascular area is more developed than the right, and when, also, the temperature of the centre where incubation is effected, is relatively low. I have otherwise accumulated numerous indications which will soon permit me, according to all appearances, to produce at will other anomalies.

"I have made, also, many experiments in order to study the manner in which evolution is carried on at temperatures above and below the normal temperature of incubation. The high temperatures accelerate its progress, and produce that diminution of stature which constitutes Nanismus. The low temperatures, on the contrary, considerably retard the progress of development, and do not permit the embryo to exist (depasser) beyond a certain period.

"It is also a remarkable consequence of my studies that they explain the absence of certain monstrosities in certain species by the differences which these species present in their evolution. Thus the absence of the amnios appears to preserve the fishes from a great number of deformities; the absence of the amnios and that of the umbilical vesicle equally appear to give to the Batrachians a still more remarkable immunity."

NATURAL HISTORY MISCELLANY.

BOTANY.

Lake Superior Plants compared with Eastern specimens. — Not long ago my attention was called by a friend, a distinguished botanist at the East, to the remarkably large and robust development of some of my Lake Superior specimens, as compared with the same species of plants found in the New England States. This is particularly observable in the plants of the earlier part of the season, where one would be led least to expect it. Among the most remarkable are the *Carices*, most of which are in full perfection by the early summer. Of these I would specify the following, a few out of many, as worthy of note in the above respect: — *Carex Backii* Boot, *C. varia* Muhl., in its many forms, *C. Houghtonii* Torr., *C. laxiflora* Lam., and *C. lenticularis* Michx. The Gramineæ, however, exhibit this condition in the most extraordinary degree. The Mountain Rice (*Oryzopsis asperifolia* Michx.) I found in flower and about two feet high by the latter part of May. The Holy-grass (*Hierochloa borealis* Roem. and Schul.), in flower early in June was over two feet high, the leaves, stalk, panicle and its component parts, proportionately large. This fragrant grass the Indian women weave into baskets and fancy articles, which they dispose of to travellers. *Koeleria cristata* Pers., growing in shady woods along rivers, flowered in July, and was rank and tall, often over five feet in height. Several species of *Glyceria* and *Poa* are also worthy of mention as singularly luxuriant. *Triticum violaceum* Hornem., I found on the northern shore of the lake, on the few gravel beaches, where it attained a height of over four feet, having an extraordinarily robust culm. The grain was well formed by the latter part of August, and up to the early part of September the plant was untouched by frosts. This is peculiarly interesting as connected with our cereals, and remembering that our common Wheat (*Triticum vulgare* Linn.) is of the same genus.

The large amount of snow which falls in the region of Lake Superior, and lies upon the land, a great warm blanket several feet thick, undisturbed by the variable temperature which affects other places, but which is unknown there, effectually protects the soil from all frost, and has a marked influence on the vegetation. The snow remains till late, and when it disappears the ground has not the delay of getting thawed out as elsewhere. I have frequently found snowdrifts in the woods from one to two feet deep, which remained well into June under the shade of the cedars, and this when it was unpleasantly warm in the openings. The sun, too, has a greater power there than commonly supposed, almost counterbalancing the shortness of the summer. Violets, which I found in May (*Viola blanda* Willd., *V. Selkirkii* Pursh., etc.), had evidently been blossoming during the winter, which corroborates what an old resident of

Lake Superior told me, viz., that any time during the winter violets could be obtained by digging away the snow. *Adenocaulon bicolor* Hook., I found in June, three feet high, in full blossom, and having almost a tropical luxuriance; and towards the middle of that month *Lathyrus ochroleucus* Hook., twined its elegant wreaths of cream-colored or pale-yellow flowers in graceful profusion. Instances might be multiplied did space permit.—HENRY GILLMAN, *Detroit, Mich.*

ZOÖLOGY.

GLYCERINE FOR PRESERVING NATURAL COLORS OF MARINE ANIMALS.—While collecting on the coast of Maine last summer I made numerous experiments with glycerine, most of which were eminently satisfactory. At the present time I have a large lot of specimens which have the colors perfectly preserved and nearly as brilliant as in life. Among these are many kinds of Crustacea, such as Shrimp and Prawns (*Hippolyte, Crangon, Palæmon, Mysis*, etc.), Amphipods and Entomostraca; also many species of Starfishes, Worms, Sea-anemones (*Alcyonium, Ascidians*, etc.). The Starfishes and Crustacea are particularly satisfactory. The internal parts are as well preserved as the colors, and in these animals the form is not injured by contraction, as it is apt to be in soft bodied animals, either by alcohol or glycerine. The only precaution taken was to use *very heavy* glycerine, and to keep up the strength by transferring the specimens to new as soon as they had given out water enough to weaken it much, repeating the transfer two or three times, according to the size or number of specimens, or until the water was all removed. The old can be used again for the first bath. In many cases the specimens, especially Crustacea, were killed by immersing them for a few minutes in strong alcohol, which aids greatly in the extraction of water, but usually turns the delicate kinds to an opaque, dull white color, but this opacity disappears when they are put in glycerine, and the real colors again appear. Many colors, however, quickly fade or turn red in alcohol, so that such specimens must be put at once into glycerine. Green shades usually turn red almost instantly in alcohol. Specimens of various Lepidopterous larvæ were also well preserved in the same manner.

The expense is usually regarded as an objection to the use of glycerine. The best and strongest can be bought at about $1 per pound, but recently I have been able to obtain a very dense and colorless article at 42 cents per pound, which is entirely satisfactory. As there is no loss by evaporation, the specimens will keep when once well preserved, if merely covered by it. The expense for small and medium sized specimens is not much more than for alcohol.—A. E. VERRILL, *Yale College.*

DOES THE PRAIRIE-DOG REQUIRE ANY WATER?—Prairie-dog towns on the Plains are often situated miles away from any water that can be discovered on the surface. It is the general belief among those who are

familiar with the habits of the prairie-dog, that he does not require any more water than is contained in the grass roots on which he feeds. Gen. Marcy, in his "Army Life on the Border," expresses this belief. When the grass is growing, and the roots are tender and full of sap, it is easy to believe that this is the case. It is, however, difficult to understand how sufficient moisture could be contained in the food of the prairie-dog to replace what must be lost in respiration, etc., and to carry on the process of digestion during the months of September, October and November. At this season of the year it is not unusual for from fifty to sixty days to pass without a drop of rain falling. There is no dew, the air is extremely dry, and the short buffalo-grass (often the only thing which grows on the highlands where the prairie-dog villages are commonly found), becomes completely dried down to the roots, while the roots, being but two or three inches underground, become hard and dry.

Tame prairie-dogs are frequently seen to drink water. My belief in regard to the matter is, that in every prairie-dog town there are a sufficient number of wells to supply the inhabitants with water.

In attempting to flood dogs out of their holes for the purpose of obtaining the young ones for pets, I have found some holes that could be filled to the brim with two barrels of water, and from these holes have obtained young dogs. In other holes I have emptied three or four barrels in immediate succession, and instead of filling the holes, have heard the water last poured, continue running with a rumbling noise, deep in the ground, for a minute or more after my supply was exhausted. These holes it seems to me must be deep enough to answer the purpose of wells, and I can conceive of no other object that could induce the dogs to burrow so deeply, than that of obtaining water. They are generally of greater diameter than other holes, and go down straight from the entrance instead of obliquely as do others. While they show signs of being constantly resorted to by the dogs, they do not have the same appearance of being lived in by a family. The excrement of the dogs does not lie around them in such abundance, and the grass near has not been so extensively rooted up for food.

The prevailing belief among frontiersmen, that prairie-dogs, rattlesnakes and prairie owls all live together on friendly terms, in the same hole, is doubtless a mistake. It is founded upon the fact that rattlesnakes and dogs have been seen to come out of the same hole. The snake in such instances had, probably, been after a young dog for dinner. The prairie owl probably finds his food around dog-towns, and makes his home in deserted holes. — GEORGE M. STERNBERG.

BREEDING HABITS OF SALAMANDERS AND FROGS. — There is still a great deficiency in our information concerning the breeding habits of these animals, which many young naturalists residing in the country ought to make an effort to supply this spring. Careful observations made upon any of our frogs, recording the first appearance, the time and place of laying the eggs, the form and appearance of the egg-clusters and how

attached, the duration of the laying period, etc., are all worthy of record, as is also the history of the development of the young, but specimens of every species of which the habits are noted should be preserved in alcohol, so that the species may be accurately determined. The young should be reared, and a full series preserved, with dates.

Concerning the breeding habits of our Salamanders little is known. Mr. Putnam and others have observed the eggs of the Red-backed Salamander, which are laid under rotten wood, etc., in moist places, and are cared for by the mother, who also broods the young when hatched. The young very quickly loose their external gills, and pass rapidly through the tadpole state. Prof. Baird observed a species of Desmognathus which wrapped the eggs around its body, and remained in a moist place until they were hatched. Our common *Desmognathus fuscus*, or Painted Salamander, was observed by me in Maine, where it lives under stones in cold brooks and springs. It attaches its large ivory-white eggs in patches upon the under sides of stones. The young retain their external gills until they are nearly full grown, and at least three inches long in some cases. The eggs of the common Water Newt (*Diemictylus viridescens*) were observed by Mr. S. I. Smith and myself at Norway, Maine, in 1863 and '64, where they were found attached in rounded masses, two or three inches in diameter, and resembling frogs' eggs, on the stems of water plants growing in ditches in a meadow. The eggs were found May 5th, and the young were reared by Mr. Smith. They were hatched May 17th, and by the first of October had become one and a half inches long, with rather stout bodies and broad heads, and still retained their external gills, though they had partially acquired the colors of the adult. The experiment was then discontinued, but the specimens were all preserved.

In this species the male, at the breeding season, clasps his hind legs around the body of the female just behind her forelegs, and from the fact that a pair taken late last fall and kept in confinement were often seen in this position, it is probable that it commences breeding very early in the spring. Under sexual excitement the colors and appearance change considerably. The hind legs of the male become much swollen, and a black callosity forms on the inner sides, which aids in giving firmness to his grasp. These characters soon pass away after the eggs are laid. In salamanders and frogs the eggs and the milt are discharged simultaneously, and the eggs are fertilized in the water. So far as I know nothing has been published concerning the eggs or breeding habits of any of our other species, several of which are very common. — A. E. VERRILL, *Yale College*.

THE BITER BITTEN. — Two or three years ago a student, Mr. William Stone, while on an excursion to Mt. Carmel, a few miles from New Haven, caught a large Black Snake (*Bascanion constrictor*), and brought it home, living and uninjured, except that it was partially suffocated from having been carried by the neck. In consequence of this, probably, it became sick soon afterwards, and vomited a fine specimen of the Copperhead

(*Ancistrodon contortrix* B. and G.), about two feet long, and nearly perfect, except that the head showed signs of incipient digestion. Soon afterward this was followed by a good sized frog, somewhat farther advanced in digestion.

How the Black Snake managed to capture the Copperhead without being bitten is quite a puzzle. Possibly he took the Copperhead at a disadvantage, while he was busily engaged in swallowing the frog and so swallowed both snake and frog together. — *Ib.*

Citation of Authorities. — Without intending to discuss a question which has caused much controversy, I call attention to the fact that after a good genus has been proved, as in taking Unio from Mya, such genera are gradually adopted as occasion offers, and it is sometimes difficult to ascertain who first stated in print the fact known to all, of a given species of described Mya being a Unio.

Mr. Prime in his earliest paper on *Pisidium* (since corrected), cited Gould for *P. dubium* (*Cyclas dubium* of Say), with the synonym *P. abruptum* Hald. (Proc. Acad. Nat. Sci., July, 1841), the latter being the first to give the proper genus. If a painter were to copy a figure of Adam from Angelo, and of Eve from Dubufe, this rule would make him the proper author of both, in the new combination. But the description of *Pisidium abruptum* of July was corrected in October, in the words "*Pisidium abruptum* is not distinct from *P. dubium* Say," which, under this rule, gives me a citation to which I would not have been entitled had I not committed a blunder.

Some authors cite Prof. Baird for the Bluebird (a Linnéan species, *Sialia sialis* (Pacific R. R. Reports, Vol. 9, p. 222, October, 1858); but if the species is not Linné's, it is mine, because I mentioned it fifteen years previously as "The familiar Bluebird (*Sialia sialis*)," in a chapter on the Zoölogy of the State, in Trego's Geography of Pennsylvania, 1843, p. 77.

In the "American Journal of Conchology," Vol. 4, p. 272, a rule is proposed that "the name of the author of a species, or genus, or family, shall remain forever attached thereto, and shall be considered a part of the said specific, generic, or family name." — S. S. Haldeman.

The Loggerhead Shrike. — In the September and February numbers of the Naturalist questions are asked about the Butcher Birds returning to its impaled prey. As I have lived South, I have never seen a Butcher Bird, and so can say nothing as to its habits, but as for its Southern brother, the Loggerhead Shrike (*Collyrio Ludovicianus*), I have often watched it return to the prey which it has killed and hung on thorns. In the month of January last, in the State of Florida, I saw a Loggerhead attack a snake, of the genus *Leptophis*, nearly two feet in length, and after a sharp contest, succeeded in dispatching it. Taking it in his bill, he impaled it on the thorn of an orange tree near by, and leaving it there, flew away. A day or two after, as I was passing by, I noticed that the snake had been more than half devoured. Sitting down behind some bushes near by, I determined to keep watch, but had not remained there

long, when the shrike flew to the tree, and after eating off a small piece, again flew away. I saw this repeated next day, but by this time the remainder of the snake had become dried up and hard, and though I watched several times, he did not return to it. Since then I have often seen them return to lizards and tree toads which they had empaled.—H. S. GEDNEY, *Potsdam, N. Y.*

CASE WORMS.—Every dabbler in pools is acquainted with the singular Caddis or Case-worms, which walk over the bottom like moving sticks, or a mass of animated sawdust, or minute pebbles when the bottom is composed of either of those substances. The most puzzling form is that which we here figure (Fig. 32), received from a correspondent in the Middle States. It is a species of Helicopsyche, and was by some conchologists (I. Lea, Transactions American Philosophical Society, 1834, p. 101) thought to be a fresh-water shell (Valvata). It is extremely interesting as repeating among the aquatic neuropterous larvæ the form of the snail-like terrestrial larva of *Psyche helix*, a moth.

Fig. 32.

Regarding these cases, Dr. Hagen writes us as follows: "Phryganeid cases like those sent, are described by me in the Stettin Entomologische Zeitung, 1864, p. 130, as *Helicopsyche glabra* Hagen, from a specimen received from the collections of Prof. Dunker, labelled *Valvata arenifera* Lea, North America. The *Valvata arenifera* Lea, from Tennessee, Cumberland River, near Nashville, seems different, and my specimens described (Zeitung, p. 129, No. 8) from Mexico, are perhaps identical.

"*H. glabra* is mentioned in a "Note on Certain Insect larva-sacks, described as species of *Valvata*" (from Troy, N. Y.) by Mr. Th. Bland, Lyc. Nat. Hist., New York, Vol. 8, p. 144, and the case and the parts of the broken imago were identified by me and described in the Entomologist's Monthly Magazine, Vol. II, p. 252, and Stettin Entomologische Zeitung, 1866, p. 244. The cases are identical with my *Helicopsyche glabra*, and the imago with my *Notidobia borealis*, Synopsis of North American Neuroptera, Vol. 1, p. 271. It has also been received from Canada.

"I have seen the pupa skins, but never the larva, neither the operculum of the case. The description of the larva would be very interesting. Perhaps you will find an *asymmetrical* animal, to judge from its manner of living in a trochiform sack. I think this would be the first asymmetrical larva among the hexapodous insects.

"Among the described American Phryganeidæ, I have no doubt that *Notidobia lutea* Hagen, pertains to *Helicopsyche*. Brauer has described (Voyage of the Novara, Neuroptera, Vol. 1, p. 26–30) and figured the larva and pupa of *Helicopsyche Ceylonica*, and says nothing about an asymmetrical position, but not having seen the living specimens, perhaps it was overlooked. Prof. Von Siebold long since wrote to me that he supposed that an asymmetrical posture would be observed in the living larva.

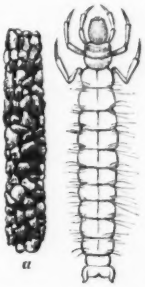
"In the Stettin Entomologische Zeitung, 1865, p. 205, I have given a list of the described American molluscan species, pertaining to the *Helicop-*

syches. I remarked that Frauenfeld (Wiener Zoologisch-Botanischen Gesellschaft, 1864, p. 623) proves that *Paludina lustrica* Say, is a mollusk, and not a Helicopsyche, as supposed by me from a specimen in the collection of the celebrated conchologist, Prof. Dunker."

Fig. 33.

We also figure (Fig. 33) an interesting form found near Portland, Maine, by Rev. E. C. Bolles. The larva builds a thin long conical sandy tube, supported between two "needles" of the pine. We do not know the adult form. Fig. 34 (larva and case) represents a very abundant Case-worm, which we have found in great abundance in Labrador. Though we do not know the imago, we suppose it is the *Limnophilus subpunctulatus* Zetterstedt, a very abundant species in the arctic regions.

Fig. 34.



a

The imago of the Caddis-fly has a rounded body, with moderately broad, parallel veined wings, which are folded on the sides of the body, and the head is provided with long antennæ and palpi. The smaller species are often hardly distinguishable from many small moths. The females lay their eggs in gelatinous masses on aquatic plants, above or beneath the surface of the water. The larvæ are found abundantly in the bottom of ponds, in cylindrical cases of grass or stems of reeds, or bits of sticks, sand, minute shells, etc. They assume different forms, sometimes a long, conical shape, or imitating snail shells. The larva lines the interior with silk, and by bristles on the side of the body and a pair of anal hooks keeps its body adhering to the sides of the case while it drags it over the bottom. They eat large quantities of minute water fleas (entomostraca) and small insects, while many are herbivorous, the larger ones eating whole leaves that have been submerged, while the smaller ones leave the veins entire. When about to change to pupæ, the larvæ close up the mouth of the case with a net-work like a grate for the passage of the water for respiration. When about to leave the pupa state they crawl up stems of plants, or the smaller species use their light cases as rafts to rest upon as their wings are drying.

Fig. 35.

Neuronia semifasciata (Fig. 35) is our largest species, and is taken away from damp places; but the smaller species are only taken on leaves of bushes and herbage by streams and ponds. They run swiftly, but fly with some difficulty. The species are numerous. We should be greatly obliged for living specimens of the *Helicopsyche.* — A. S. P.

GEOLOGY.

THE PLAINS OF KANSAS.—Six companies of the 10th U. S. cavalry marched from Fort Riley, Kansas, on the 15th of April, 1868, under orders to encamp for the summer near Fort Wallace. The route is along the line of the Union Pacific Railroad, eastern division, which is now completed to within thirty miles of Fort Wallace. This is known as the Smoky Hill route.

It is very generally believed that the plains are level prairies like those of Illinois; but this is not so. By the plains, frontiersmen mean the country west of the settlements, to the base of the Rocky Mountains. Along the line of the Smoky Hill River, the country is rolling and constantly broken by ravines. My notes commence at Fort Harker. This post is situated on the Smoky Hill, eighty-five miles west of its junction with the Republican, and two hundred miles from the Missouri River.

The soil in the river valley is deep and rich, as is also that of the numerous creeks flowing into it. The bluffs are mostly unsuited for cultivation, being formed of gravel and clay, covered with a soil but a few inches thick. The buffalo grass, with which the high ground is covered, does not grow more than three or four inches high, but is very sweet and nutritious, and is preferred by animals to the longer grasses found in the river bottoms. It is said by those who have been on the plains for many years, that as the buffalo is driven westward, the buffalo grass is replaced by others of more vigorous growth, especially by the blue-joint grass, which reaches a height of two or three feet. I was led to believe this true by personal observation, and it is probable that as the ground becomes covered and shaded by grasses of more luxuriant growth, and as forest trees obtain a more extensive foothold, the climate will be benefited, and there will be a more equitable fall of rain throughout the year. Very little rain falls from July to March, and a large proportion of that is carried off within a few hours by the numerous creeks, which are dry at other times in the dry season.

Timber is only found on the plains along creeks and in ravines, where it is protected from prairie fires by the abrupt banks which are bare of grass in consequence of the constant falling away of the earth along their steep sides. The principal varieties of timber about Fort Harker are cotton-wood, oak, elm, ash, black-walnut, hackberry, box-alder, coffee-bean and willow. Timber becomes more scarce as you go westward, until approaching the mountains, where it becomes quite abundant, pine and cedar taking the place of oak and other hard wood.

One of the earliest flowers is the Prairie-pea (*Astragalus Mexicanus*). The fruit is about the size of a green gage plum, and is very abundant, the fleshy pod being the part eaten. It tastes like the pod of the common pea, but when cooked is insipid and rarely eaten. A wild Hyacinth is found in the lowlands, and the Poppy-mallow (*Malva Papaver*), which a little later in the season is found in extensive beds, with its purple blossoms and dark green leaves, forms one of the most brilliant figures in the

prairie carpet. The blue flowers of the Spiderwort are scattered over the bluffs, and a variety of Sida, with rose white flowers, form bright patches on the buffalo wallows. Along the steep banks of the creeks and ravines, the sensitive Brier (*Schrankia*) is to be found, not blossoming, however, till late in May. The blossom is unique and beautiful. It is a round composite head; the numerous long purple filaments make of it a silken tassel, the anthers tipping each thread with gold. The Prickly Poppy (*Argemone*) looks now like a common thistle, but in July it will put forth its large pure white blossoms.

The rock about Fort Harker is a sandstone of the Cretaceous period. It varies from a soft white stone, that may be broken up into sand by the hand, to a hard dark red stone, according to the amount of oxide of iron it contains. Where it has the right proportion of iron it is easily worked and makes an excellent building stone. The quarters at Fort Harker are built of it. While the quarry was being worked a large number of impressions of leaves of trees of existing species were found, the willow and oak most abundantly. Near the mouth of Wilson's Creek, twenty-two miles west of Harker, is a bed of lignite, which is being worked by a joint stock company. I was not able to visit it, but saw some specimens of the coal, and doubted if the sanguine expectations of the stockholders would be realized. At Fossil Creek, fifteen miles from Wilson's Creek, there is exposed a stratum of limestone, filled with a large fossil conchifer unknown to me. At Big Creek, near Fort Hays, we found antelope and buffalo abundant, and several buffalo calves have been caught and are being raised on cow's milk. They soon become quite tame.

I have had a serenade every morning and evening from a mocking-bird which has located himself in a large elm tree in the rear of my tent, the only mocking-bird I have heard in this State. There are beaver dams all along the creek, and numerous trees, recently cut down by sharp teeth, show that they are still plentiful.

A variety of wild mustard found here in damp places, makes excellent grass. In addition to those found at Fort Harker, there are a variety of Anemone with white and blue flowers, and a delicate pink Verbena. A variety of Penstemon (*P. grandiflora* and *P. Digitalis*) are found at Fort Harker later; and two varieties of Allium, the flowers of one, if crushed, giving out a delightful fragrance, while the stem, if crushed, emits a strong odor of garlic; and also *Castilleja sessiliflora*, *Ellisia Nyctelæa*, and a great variety of plants belonging to the order Leguminosæ. The rock about Hays is a soft chalky marl, unfossiliferous as far as I could learn.

On the 25th of May we resumed our march westward, on the second day passing through a swarm of grasshoppers, extending about two miles. These plains are, doubtless, the breeding places for the immense swarms, which at times devastate portions of the State farther east. We encamped the 29th near Castle Rock, forty-nine miles west of Hays. This rock at a little distance looks like an immense old castle in ruins. It is ninety-one feet high, and about three hundred in circumference. It is composed of a bluish, friable, argillaceous shale about one third of the

way up, and above this of a light yellow compact marl. It was evidently, at one time, continuous with some bluffs of the same character a mile south of it. The 30th we encamped at Monument Station, which receives its name from a number of columns of the same character as Castle Rock. There is a company of Infantry stationed here under command of Brevet. Lt. Col. Cunningham. As I rode up in front of Col. Cunningham's quarters, the first thing that met my eye was a pile of fossil vertebræ, and the jaw of an immense Saurian. The jaw is over three feet long and is well preserved. The Colonel has already dug out sixty vertebræ. He estimates the length of the reptile at thirty feet. He was lying in a stratum of brick-red clay, below which is the shale and above the marl, which is described as forming Castle Rock. By hunting in the same locality I succeeded in finding a large number of shark's teeth, and the tooth of a Saurian. On the day following I found a place where the shale I have spoken of was uncovered, and on its surface picked up a quantity of fishes vertebræ, and some teeth. I found also the jaw of some small reptile, and just as I was returning, stumbled upon a pile containing about two bushels of fragments of fossil bone. The bones were badly broken up, but still sufficiently preserved to show that some unfortunate Saurian had been buried there. Between this place and Fort Wallace I obtained numerous specimens of fishes' vertebræ, and three vertebræ of a smaller Saurian. I am informed by Ass't Surgeon Turner, U. S. N., that he has forwarded to the Museum of the Academy of Natural Sciences, at Philadelphia, a very perfect specimen of a Saurian, which he estimates to have been fifty feet long. It was found in the blue shale of which I have spoken. Fort Wallace is situated near the extreme western boundary of Kansas, within two or three miles of the Colorado line. The post is built of a light yellow marl, which may be readily sawed into blocks with a common hand-saw. A variety of Spanish Dagger (*Yucca*) is very abundant here, and is now in bloom, as is also the Mammilaria macromeris, which has a beautiful rose colored blossom, and the prickly-pear is beginning to put forth its large yellow blossoms.

We have in camp three young antelopes caught upon the march. They have become quite tame. The black-tailed deer is found in this vicinity, which is about as far east as it ranges. I have slighted the centipedes and the rattlesnakes, but it is not because they are scarce. One of the officers shook a large centipede from his boot the other morning, and nearly every one can produce a handful of rattles as proof that rattlesnakes are becoming scarce.—Dr. G. M. Sternberg, U. S. A.

MICROSCOPY.

A new Process of Preparing Specimens of Filamentous Algæ for the Microscope.—The working microscopist well knows how little really valuable information, of a practical character, is to be found in books professing to treat of the subject of preparing and mounting specimens of the lower families of Algæ, so as to exhibit in a satisfactory

manner the characters which distinguish them in a generic or specific manner. This remark also applies, although with not so much force, to other branches of microscopic manipulation, as there are really many valuable hints to be found in the books descriptive of preparing woods, bones and other hard tissues, and the subject of injecting has received much attention, so that the labors of the student are very materially lightened by the perusal of the works of the German, English and French manipulators. But in microscopic botany our information is woefully deficient and old. The microscopist is therefore driven to the necessity of experimenting, and, as a consequence, discovering for himself. As the students of the lower families of plants are at the present time somewhat numerous, the result has, of course, been the development of many extremely valuable processes tending to simplify their study; but it is to be regretted that, whether from extreme modesty, or perhaps from some other cause, such as the fear that their processes are not new, or would not be appreciated, these gentlemen have, unfortunately, failed to publish. It cannot be denied that this mode of action is wrong, and that no one has a right to withhold the knowledge he may possess on such points. For my part I have taken every opportunity of publishing, or otherwise making known, any little point in manipulative microscopy which I have found of value, and which I have thought would in any way be of use to others.

For years I have been engaged in the study of the lower families of Algæ, more especially the Diatomaceæ, and for the purpose of eliminating their characters, I have at different times experimented upon the preparation and preservation of these beautiful forms, so as to be enabled at any future time to exhibit them in the best manner for showing their peculiarities. I have already published processes for obtaining the siliceous loricæ of Diatomaceæ from guano, and also several modes of collecting, preparing and mounting for the microscope these organisms. It is now my intention to make known a process I have contrived by means of which the filamentous forms of Diatomaceæ, Desmidiæ and Confervæ, can be preserved and mounted so as to show many of their characters, although, as is always the case, something has to be sacrificed. However, it is in my opinion the best process that has been as yet made public, and even if it is of no other value, I trust it will have the effect of drawing from others records of their modes of manipulation, so that searchers after truth, like myself, may learn something of value to them in their investigations.

It is well known that the Desmidiæ and the filamentous Algæ, generally found growing in fresh water, have never been preserved in a satisfactory manner, and this has arisen from the fact that their cell-walls are composed of a substance of a perishable matter, and will not, like that of the Diatomaceæ, which is siliceous, bear boiling in corrosive liquids so as to remove the always readily decomposable cell-contents, and leave the object clean and transparent, while the Diatomaceæ, after such treatment as boiling in acid can be mounted in Canada balsam, by means of which

they are presented in such a state that the finest sculpture of their siliceous epidermis can be observed, and they are at the same time held within a preservative substance which does not permit of their movement and consequent danger of fracture; the Desmidiæ and the filamentous Algæ in general cannot be preserved so, and several means have been devised to keep them, all of which have been to a certain extent unsatisfactory. Besides there are some Diatomaceæ which grow in chains, as the Fragillaria, the frustules of which are united by means of a substance that will not bear the contact of acid necessary to remove the cell-contents; and again there are others, as the Gomphonema, which are attached to submerged substances by means of a flexible stalk called a stipe, which would dissolve under the same circumstances. Such Diatomaceæ have been generally merely placed in a cell formed of cement or other suitable substance, and preserved in a preservative solution consisting either of pure distilled water, or water containing creosote, camphor, or other substance possessing antiseptic properties. And the same plan has been followed with the filamentous Desmidiæ and other Algæ, but such specimens become, after a short time, unsightly. It is true that the general outline is preserved, but the cell-contents either contract or change in form and color, so as to injure the appearance of the specimen, or the same effect is brought about by the colored matter generally accompanying gatherings of such organisms.

My plan then is essentially as follows: Supposing I have a gathering consisting for the most part of a filamentous Desmid, as *Desmidium Swartzii*, which is a common species around New York city at certain periods of the year, I place a small quantity of it in a test tube, and pour over it, so as to about quarter fill the tube, a strong solution of the so called "chloride of soda," which I prepare for the purpose in the following manner. Those, however, who have not the facilities for doing so, or do not desire to prepare their own solution, can use that sold by the apothecaries under the name of "Labarraque's Solution of Chloride of Soda," which is, however, rather weaker than it is best often to use. My solution I make by adding to the water a large excess of the common chloride of lime of the shops, which is fresh and has not stood for a time in an open vessel exposed to the air, by means of which much of it becomes decomposed and useless for this purpose. After stirring well, and then allowing such a mixture to stand for a short time, until all that will not dissolve falls to the bottom, I pour off the clear liquid and add to it a concentrated solution of carbonate of soda, the common "washing soda," until the white precipitate of carbonate of lime, or chalk, ceases to form. The clear solution is now poured off preferably through a good paper filter, and preserved in a well-corked bottle, away from the light. This is my solution of chloride of soda. The Alga is now boiled for a few minutes in the solution, but not so violently or for such a length of time as to break up the filaments, and then well and thoroughly washed with pure filtered or distilled water. It can thereafter be preserved in weak spirits, or, what I have found still better, water to which a few

drops of creosote have been added. Thus the growth of fungi is prevented, which would otherwise mar the appearance of the object very materially.

To mount such bleached specimens, I proceed as follows. Those which have been set aside in creosote water may be, of course, put up permanently in that liquid, but those which have been preserved in spirits, I prefer to mount in creosote. A cell is procured of any suitable substance, as black varnish, gold size, marine glue, or other cement which will withstand the action of water, and a fragment of the Alga being placed in it in the usual manner, water is added, and a fine glass rod or stick of wood just moistened with creosote brought in contact with the liquid. In this way the water becomes sufficiently impregnated with the preservative to insure its antiseptic action. The cover is then put on and cemented down. Thus we have a specimen of the Alga in a transparent condition, all colors which interferes with the observation of many points of structure being removed. In place of creosote water I have made use of camphor water, and found it to answer admirably. The camphor water I make by using distilled water, and just before placing on the cover, putting in a grain of gum camphor, which then remains in the cell, and if near the edge does not mar the appearance of the object in any way. Specimens can also be mounted in the glycerine-jelly of Mr. Lawrence, which preservative I find to be excellent for all kinds of Algæ and vegetable preparations generally; in fact after a little practice, the manipulation of it becomes almost as easy as that of balsam, and air bubbles, those torments of beginners, are the exception and not (as is the case for a long time generally after a tyro begins mounting microscopic objects) the rule. Of the use of this jelly, or rather a modification of it, I shall at some future time have more to say.—ARTHUR MEAD EDWARDS, *New York*.

ANSWERS TO CORRESPONDENTS.

J. T., Tabor, Iowa.—The Land and Fresh-water Shells of the United States, by Binney, Prime and Tryon, published by the Smithsonian Institution, will be the most modern works for reference. Descriptions of Unios, etc., are mostly contained in the writings of Isaac Lea, of Philadelphia. The best way to procure specimens for your college, is to make good collections of your native animals and plants, and then exchange them with other parties. We will announce such desires to exchange free of cost.

E. G., Albion, Wis.—Your specimens considered as *Ophioglossum reticulatum* Fries., does not seem to differ from dwarf and depauperate specimens of *O. vulgatum*, nor do the reticulations differ in any way that I can perceive, on comparison with British or with New England forms. Never having seen either a description or authentic specimens, such as you say were collected by Prof. Kumlein, I have no means of speaking with any certainty. The same style of reticulation occurs in *O. bulbosum* Michaux, a Southern variety; and as the species is very variable, it is probable that *O. reticulatum* is but a local variety, though the botanical authority of Fries is of great moment regarding any plant which comes under his observation.—J. L. R.

B. F. L., Concordville, Pa.—To your query, "How long will spiders live without eating?" we would reply that adult spiders, like adult six-footed insects, will fast for months, though when young and growing they are usually voracious. How your young spiders lived twenty days after hatching without food, we do not understand, though we have observed that the young of the Moose tick lived nearly a month without food after hatching.

The Tarantula is confined to the Southern States, though the Editors of the "American Entomologist" report the occurrence of *Mygale Hentzii* in Missouri. It may possibly occur in Eastern Indiana. Spiders are well known to be cannibals, the females

after their love passages with their partners, frequently falling upon them and devouring them. The "Guide to the Study of Insects" will contain chapters on the *Arachnida* and *Myriapods*, with numerous illustrations.

C. E. R., Roxbury.—The field lies before you at low tide. The best books you can have are those exposed to you by nature. It will be impossible for you to study all until you have mastered some of the leading principles of zoölogy. And the best way to commence is to select some group, among the mollusca for example; collect all the species you can, study them, ascertain all you can regarding their habits. Work patiently from year to year; be sure you have a love for it at every step. If you choose the mollusca, Gould's Invertebrata is the best and only guide, a new edition of which will be out soon, in connection with Woodward's Manual of the Mollusca. 12mo, London. Should you study the radiates, Agassiz's Seaside Studies, published by Ticknor & Fields, is the best for reference. As for the crustacea and worms, their descriptions are scattered through many publications, especially the Journal, Proceedings and Memoirs of the Boston Society of Natural History.

H. G., Detroit, Mich.—The specimens boring the hickory were *Clytus pictus* in the larva, pupa and beetle stage; the other larva also found in the hickory log, seems to be the larva of one of the *Cleridæ*. We should be greatly obliged for any specimens of Coleopterous larvæ for the Museum of the Academy, which already has a good collection of the early stages of insects. Will not all our friends, who perhaps do not usually preserve larvæ in their entomological expeditions, send them to us, especially the larvæ of *Carabidæ*, and those injurious to fruit and forest trees. If possible, put the larvæ, pupæ and beetle together in a vial, with whiskey. Will our Southern friends, as the season opens, remember that we want specimens of the Cotton Ball Worm and Army Worm, in all their stages, including the Moths, which can be sent in folded papers, by mail, though better in stout chip or pasteboard boxes.

R. S., Waverly, N. Y.—In order to reply to your question as to the locality where the stone used by the Indians for making arrowheads was obtained, it will first be necessary to know the exact species of mineral your arrowheads are made of, as several minerals were in common use for the purpose, and many arrowheads, knives, etc., were undoubtedly made from minerals only existing in localities far distant from the spot where the manufactured articles were found. The hornstone (a mottled drab-colored stone), which was in very common use for arrowheads, etc., has generally been supposed to have been taken from Mt. Kineo, on Moosehead Lake, in Maine, but that it also occurs in other places, is evident from the fact that Prof. Wyman has in his cabinet a stone which he picked up at a gravel bank in Cambridge, identical with the mineral from Mt. Kineo. Several characteristic varieties of jasper occur in Lynn and Saugus, and were much used for arrowheads, etc. Dr. True has a short paper in the Proceedings of the Portland Society of Natural History, Vol. I, p. 165, on this subject, but sufficient attention has not yet been given to this very interesting subject to enable one to trace the source of all the minerals used. We are receiving specimens of arrowheads, knives, axes, gouges, pottery, etc., etc., from various parts of the country, and hope in time to add our mite to the general stock of information on this subject. We should be pleased to receive any specimens you could obtain for us from your own or other localities, to add to the Academy's collection.

W. E. E., Dorchester, Mass.—The shells from a spring are *Pisidium variabile*.

SCIENCE GOSSIP.—Our subscribers (before February 15th) should have received their copies of Science Gossip by this time. If not received please informs us, as we have notice from the Editor that they have been mailed. We receive subscriptions for the "Gossip" at any date, and can secure back numbers.

A. S. J., Iowa City.—Lectures on Comparative Anatomy and Physiology of Vertebrate Animals. Part I. FISHES. By Richard Owen. London, 1846. Longman, Brown, Green & Longman.

J. H. B., Richmond, Va.—Lippencott & Co., of Philadelphia, have published an illustrated work on the Birds of North America, by Baird, Cassin & Lawrence. 2 vols., 4to, with one hundred colored plates. Price $22.50. Atlas sold separate for $17. Prof. Baird's Report on the Birds of North America (ninth volume of the Pacific Railroad Surveys) is now the standard work on American Ornithology. We can furnish copies of either works.—Cooke's Fern Book, $1.00.

SEVERAL CORRESPONDENTS have asked questions regarding the use of Carbolic acid as a substitute for alcohol, etc., to which we answer that Carbolic acid in water alone will not preserve animals, but pure Glycerine, with a very small amount of Carbolic acid (say about three or four drops of acid to 2 oz. of Glycerine) answers admirably for some delicate animals. But the best thing for preserving most animals is alcohol. The contraction of animals put into alcohol (complained of by some correspondents) is caused by the alcohol being too strong. All animals should be put into weak alcohol at first (not over twenty-five or thirty per cent.), and after remaining a few hours should be transferred to about seventy-five or eighty per cent. alcohol. A very fine article for preserving the tissues of animals, and for soft animals like mollusks, actinias, worms, insect larvæ, etc., can be made after a few experiments, of Glycerine, a little of the strongest alcohol, and a very small portion of Carbolic acid. This preparation will preserve the colors as well as the tissues. A little fine soap (white castile is the best) put into alcohol will prevent most colors from fading, unless exposed to direct sunlight.